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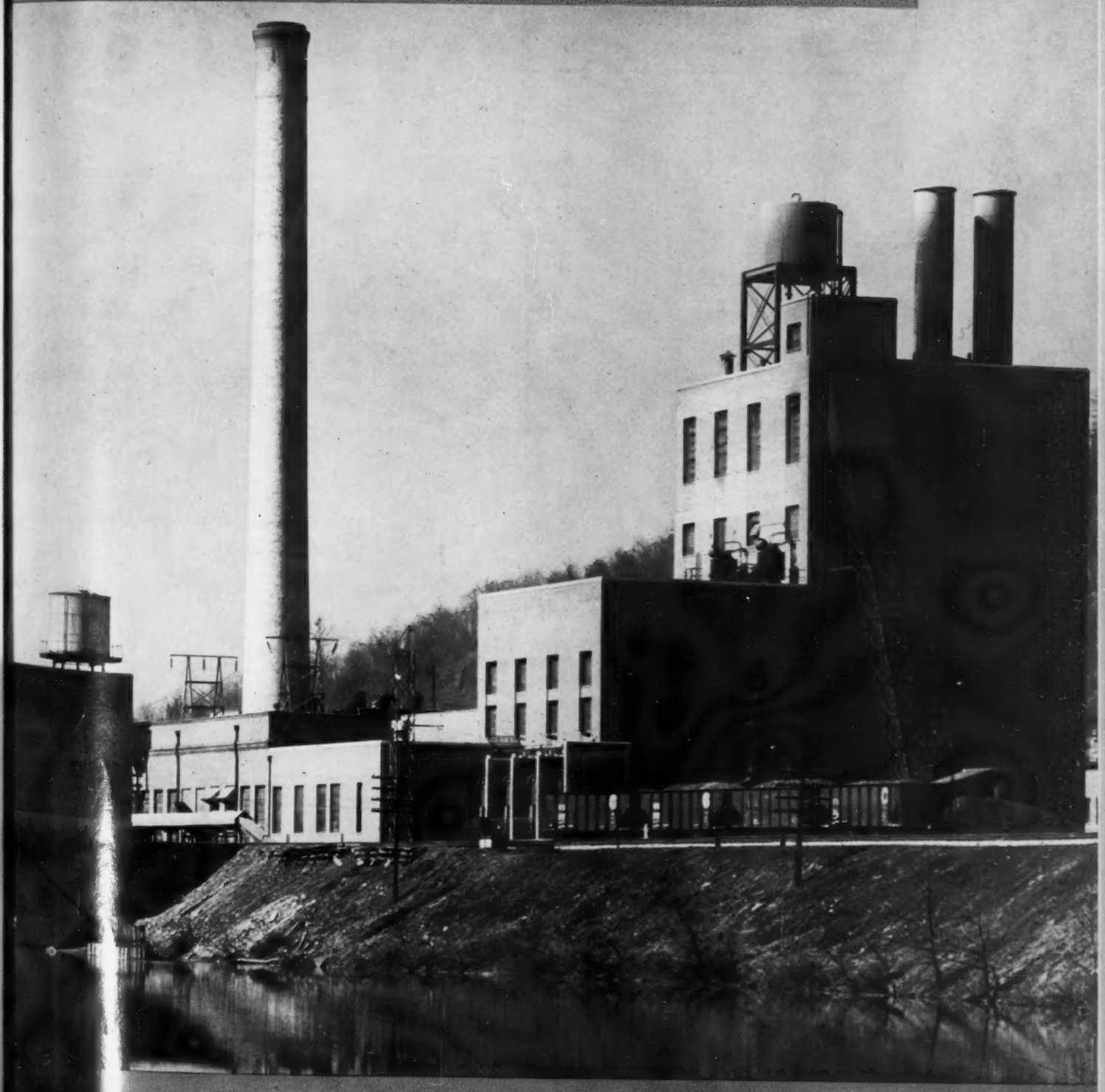
# Electrical World

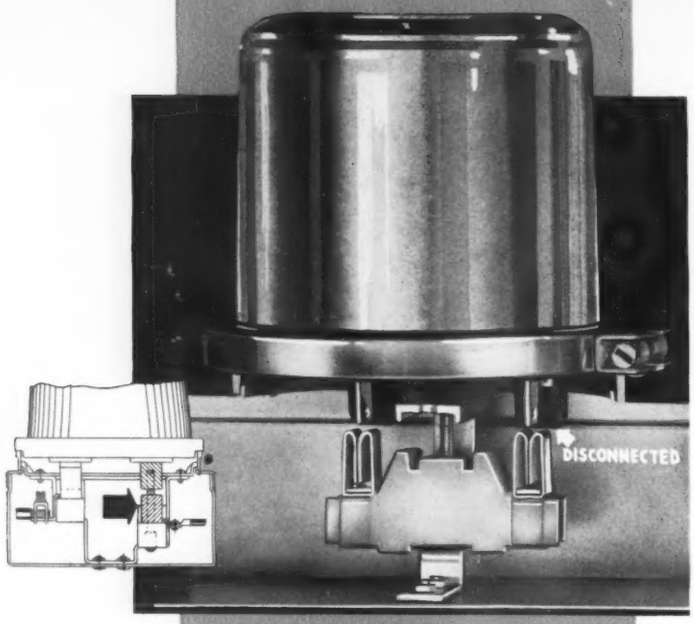
APRIL 22, 1939

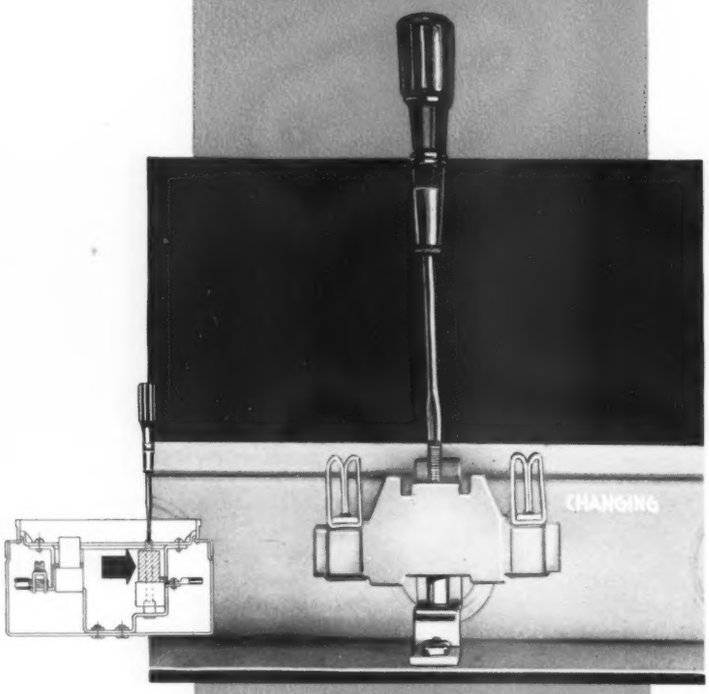


COMPACTNESS—A Design Feature of Cumberland

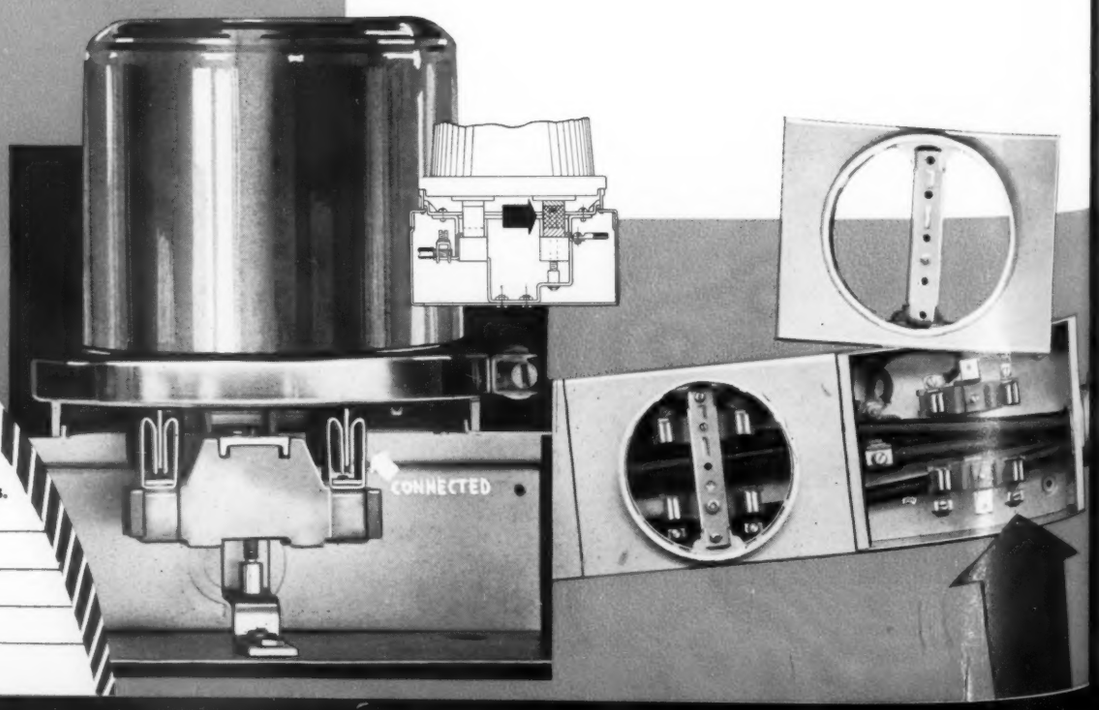
# *Simple as turning a screw —*

## THE MURRAY DISCONNECT




**In these photographs and sketches the extremely simple principle of the Murray Disconnect is made clear. The meter trough is provided with contact jaws which engage the in-built blades on the meter. But these contact jaws are made movable, with respect to the meter blades, by the single Murray Disconnect Screw. By merely turning it, contact between meter and line is definitely MADE or as definitely UNmade. Send the coupon for the whole story. Metropolitan Device Corporation, 1250 Atlantic Avenue, Brooklyn, New York.**

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# The Penalty of Progress

Each new thing that comes along that does something better, or quicker, or cheaper than something else disturbs social and economic conditions and somebody has to pay the penalty of progress.

No industry has been a worse offender against others in that connection than the electrical. It displaced gas and oil for lighting, ice for domestic and commercial refrigeration, steam engine drive, many forms of transportation on the street and in buildings, individual power plants, riveting, innumerable manual operations—the list would be far too long to enumerate. It replaced other forms of energy because of its lower cost, greater flexibility, convenience, cleanliness, quietness, etc.

And now it too must pay the penalty of progress. More efficient devices for using electrical services are reducing the unit consumption. Two of the modern refrigerators, for instance, use about as much energy as one ten years or more old. The fluorescent lamp uses considerably less energy per lumen of output than the incandescent lamp. In another direction the Diesel engine is making deeper inroads into the industrial load.

The penalty of progress, however, does not always have to be paid in the same coin. Frequently what seems like failure today can tomorrow be a harvest. The radio, for instance, seemed to sound the knell for the graphophone, but today, with radio's assistance, sound recording is doing a bigger business than ever.

More efficient devices do not necessarily lessen the market; they may, in fact, extend it into territories formerly closed. More efficient refrigerators, for instance, open up the low income market still further, while fluorescent lamps bring to us a 100-ft.-candle market not before attainable.

Likewise, the Diesel might not be altogether harmful. It might open our eyes to possibilities in industrial and commercial rates that we do not now see. It might cause us sooner to get an answer to the baffling problem of demand rates. We might even find that certain loads were better off our lines than on them. And, finally, we might find that this competition had forced us into better sales and promotion of our industrial service and thus improve our industrial load both in characteristics and earnings.

The worst penalty of progress is the fear which places the victim on the defensive and prevents him from showing his best side. Where progress, however, is met intelligently, the only penalty is hard work, which in the end can advance one further than if that element of progress had never been known.

# CUMBERLAND—COMPACT,

GEORGE S. HUMPHREY, *Potomac Edison Company, Hagerstown, Md.*

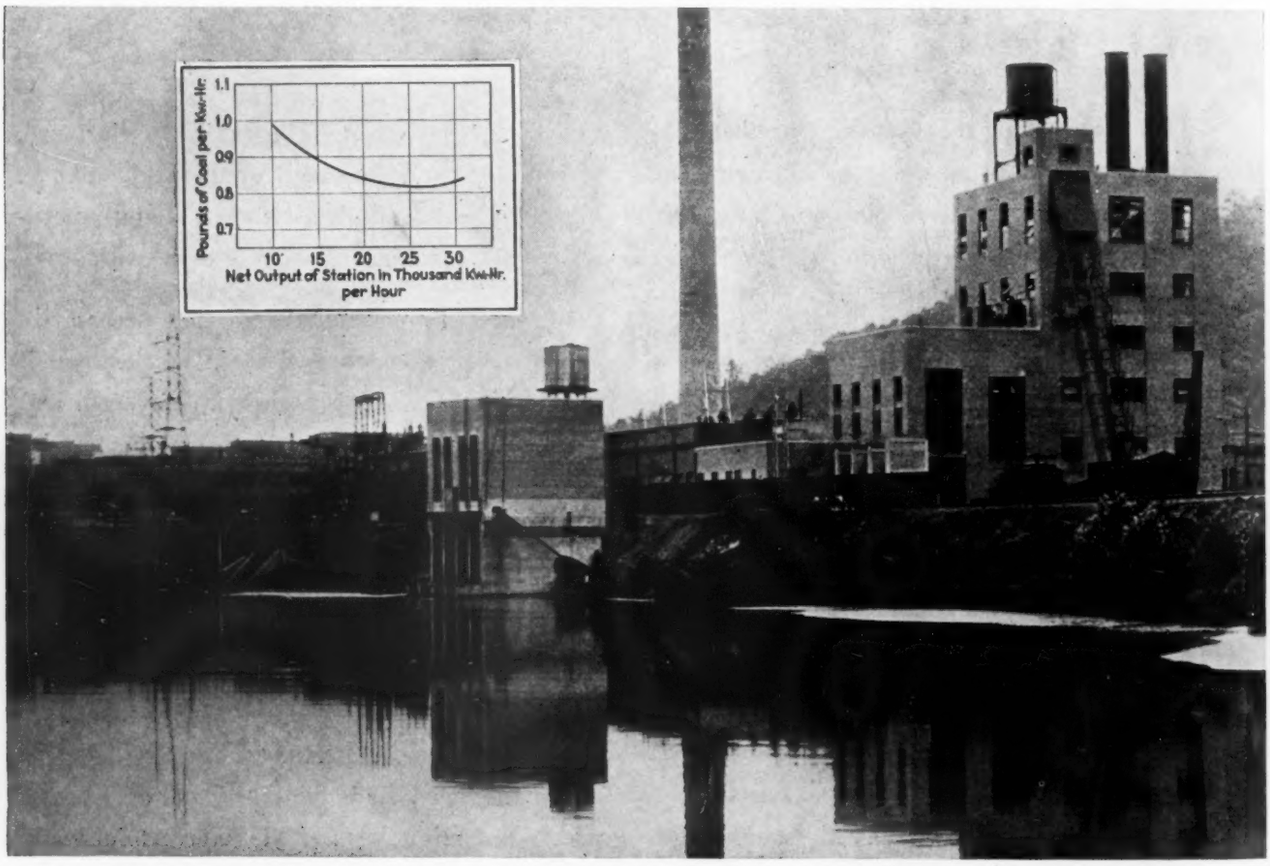



**Fig. 1—Upstream view of enlarged plant. Insert covers actual operation at steady loads for short periods; equivalent to 100 per cent load factor operation. Best monthly coal rate 0.886 lb. per kw.-hr. output with L.F. of 63 per cent. Continued operation will probably improve this**

AVAILABLE load-center space so limited as to restrict the dimensions of the new power house building to about 80 by 100 ft. in plan dictated not only many of the features of design of the new 30,000-kw. Cumberland station but also of the construction methods used. Outstanding among these are: An intake and pump house separated from the plant by main line railroad tracks but connected thereto by a 110-ft. pipe tunnel; arrangement of equipment on galleries in the high, narrow building; maximum utilization of coal and substation facilities associated with the adjacent old station; temporary bypassing of coal for the old station around the new work, and methods of construction and scheduling of deliveries to avoid interference with traffic on the railroad at one side of the site and on the boulevard on the other side.

The job was done in eleven months two days from the breaking of ground to start of operation, without interrupting service from the old 9,000-kw. station. The new station contains one pulverized coal-fired boiler and a condensing turbine operating at 825 lb. and 825 deg. F. The station economy for short periods of constant-load operation is shown by Fig. 1.

The relative positions of the old plant and the new construction are shown in Fig. 2. Advantage is taken of the small area to concentrate all control on the single-level operating floor, minimizing operating supervision on the numerous equipment galleries.

Special construction procedures were necessitated by the restricted space. The finished building on one side is 9 ft. from a busy concrete boulevard and the same distance on

# EFFICIENT AND SIMPLE

***Limited space and output continuance governed design and construction procedure for the 30,000-kw. increment to Cumberland power station — Job was completed, without interruption of service from the old station, in less than a year from the time of breaking ground to the start of operation***

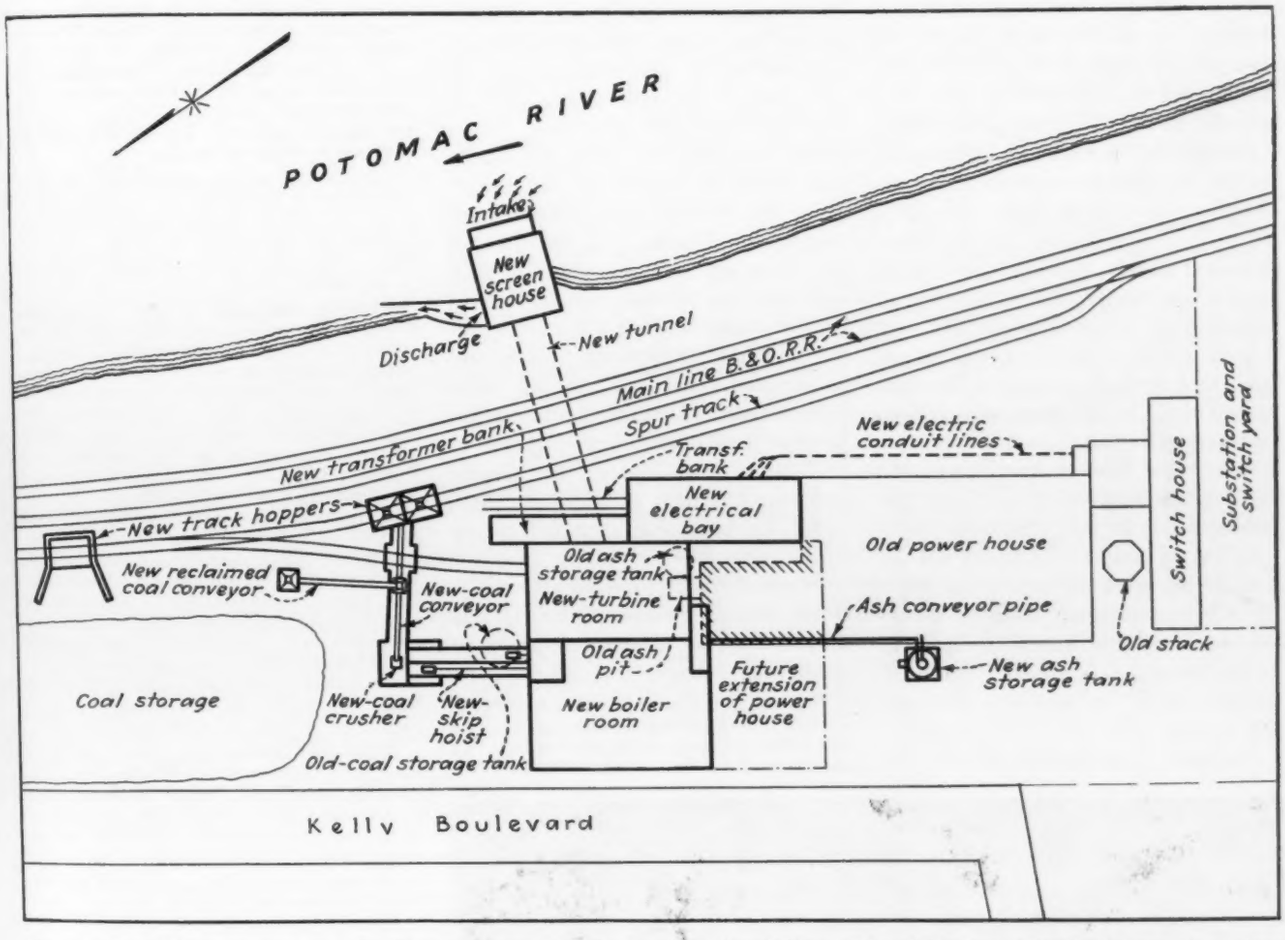



**Fig. 2—Area 0.26 sq.ft. per kw. Small-area design minimizes cost of foundations and substructure extending above river stage**

the other side from the nearest coal siding. The only space on the site available during construction for the storage of materials and equipment was the limited amount which could be borrowed from the coal storage yard. Therefore most equipment had to be placed in its final location.

When construction of the new plant was authorized, a coal larry track ran from the outside coal plant to the old firing aisle, across the space to be occupied by the new station. A new coal elevator was installed alongside the old plant and other changes made so coal could be trucked around the new work temporarily. Coal for the old plant is now carried over the new equipment to a short conveyor delivering to the old firing aisle larry.

The old ash skip hoist and tank were also within the construction area. A new tank was installed near the old plant, receiving ashes and cinders from both stations.

The range of flow of the Potomac River at Cumberland is from about 50,000 to 50 cu.ft. per second, a ratio of 1,000 to 1, with an extreme range of level of 18 ft. The main line tracks of the Baltimore & Ohio Railroad lie between the river and the site of the new plant. The new intake and pump house at the river with its operating floor above maximum flood level is shown in Fig. 1. The 13-ft. diameter tunnel beneath the tracks contains the condensing water and other pipes and gives a passageway to the power house basement.

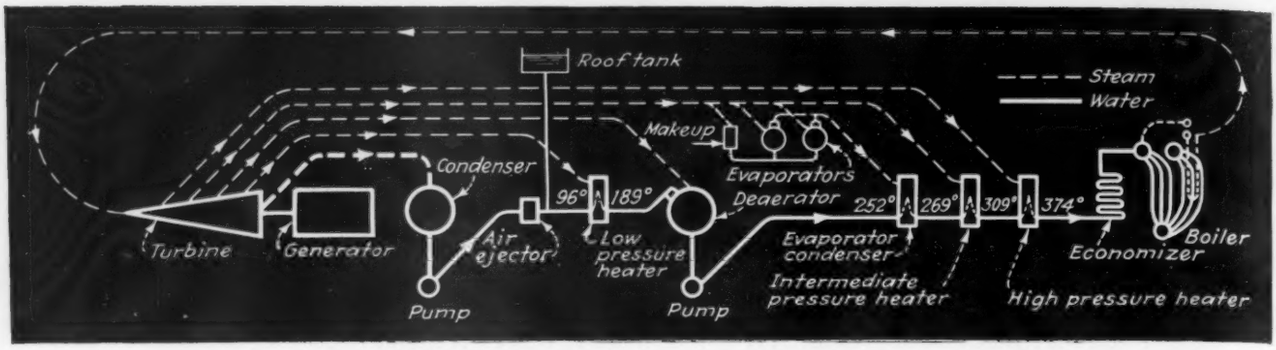



**Fig. 3—Novel diagram reflects simplicity of thermal design**

Bids taken for the construction of the tunnel appeared high, so it was built by the plant construction forces, at a saving of about 20 per cent under the lowest bid. Curved pressed steel panels 1½ x 3 ft. were placed individually as excavation proceeded, bolted together through their flanges. As the roof sections were completed they were shored. A second crew followed closely, excavating the lower part of the tunnel. When each ring of panels was completed a circular 8-in. I-beam 14 ft. in diameter was assembled and wedged in place. The concrete lining, 18 in. thick, was placed by compressed air.

The river flow in the dry season is at times insufficient to carry the station load; in this case some recirculation of condensing water will be had in the pool created in the river by a low dam some distance downstream, and by a line of sheet piling at the pump house separating the incoming from the outgoing condensing water.

Because of urgent need of additional capacity a partially built turbo-generator was bought; this was a machine which had been put into production by the manufacturer in advance of sale. High generating efficiency is obtained, with conservative steam temperature and steam extraction from the turbine at four points, with low investment, operating and maintenance costs. The diagram of the main piping connections, Fig. 3, indicates the fundamental simplicity and economy of such a system where the steam after entering the turbine is divided, each part being withdrawn from the turbine after it has produced as much electric power as will allow it still to do the needed amount of heating of the boiler feedwater, by its condensation and return to the main flow.

Some of the features of special interest may be noted, following the diagram in the direction of flow of steam and water:

The exhaust casing of the *turbine* is welded to the condenser inlet, a practice still sufficiently new to be noteworthy. The springs used to support the condenser are so set that the downward load on the turbine is automatically kept within maximum and minimum limits during all operating conditions. When the top casing is removed from the turbine or the condenser filled with water for leakage testing, supplementary jackscrews are used to control the load distribution. The turbine unit is set on a concrete foundation.

*Circulating water pumps* are of the vertical axial-flow type. The manufacturer found it possible without loss of efficiency to increase the speed of these units to 580 r.p.m., allowing less expensive motors to be used.

*Deaerator* has very complete provisions to prevent even momentary interruption of water supply to the boiler feed pumps, which might cause severe pump damage. Normal water level in the deaerator is 54 ft. above the pumps. Deaerator is designed so that it may operate under either pressure or vacuum as the turbine load varies. The air ejector required for vacuum operation was not purchased at the same time, as pressure operation was considered safer during the initial period. Emergency steam connections are made to the deaerator from one of the higher-pressure extraction lines and from a live steam line, which are opened successively by automatic valves to maintain the pressure above atmospheric. Continuous water supply is assured by a connection to the roof tank, controlled by an emergency float valve.

*Boiler feed pumps* have nickel cast iron casings. A few small initial leaks in these castings were found, but it is nevertheless considered that a worth-while saving was made over the cost of the steel castings more frequently used at such pressures.

*Automatic equipment* is provided to prevent complete stoppage of flow of water through the feed pumps. If the boiler feedwater regulators close completely, the automatic bypass control allows sufficient water to pass from the pump discharge back to the deaerator to prevent overheating.

A small *deaerating heater* is used for heating the evaporator feedwater and removing dissolved gases, to prevent tube corrosion. This heater and the two evaporator shells are connected by a common line which serves for both evaporator feeding and level control. The only float valve is one before the inlet to the small deaerating heater; that is, one cold water valve is required instead of two hot water valves.

The fuel normally used is Georges Creek coal mined near Cumberland, which is a high quality coal with about 13,900 B.t.u. per pound, 20 per cent volatile matter and ash fusing temperature of 2,700 deg. F. It burns well pulverized, and also on stokers except that some stratification results from the high proportion of fines in

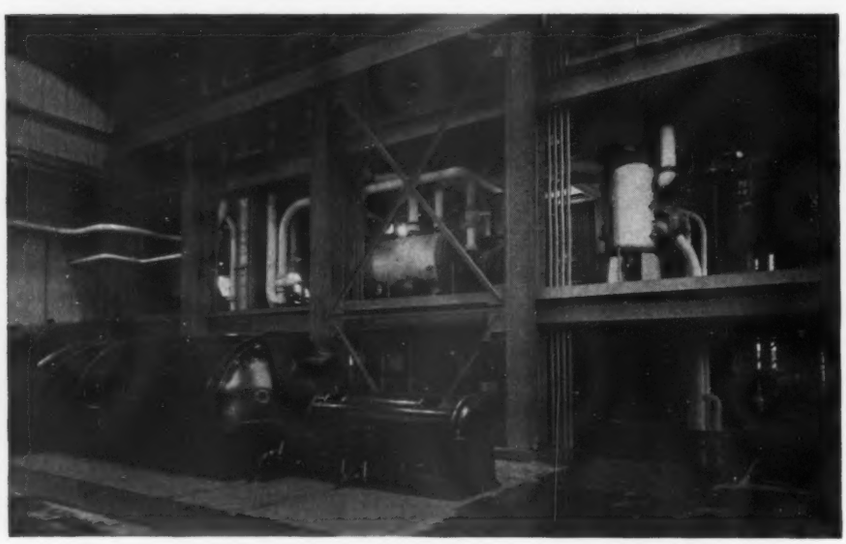


**Fig. 4—Open accessory galleries flank General Electric 30,000-kw. turbine**
In accordance with modern idea that building arrangement should reveal its functions, the galleries were left open, saving space and facilitating ventilation, heating and access.

run-of-mine coal. Pulverized coal firing was chosen mainly because of the limited ground area available and the ready grindability of the coal. The boiler is fired under the lower drum to save floor space and give long flame travel.

Control of boiler water concentration is effected by a small continuous blowdown system which is combined with a Hankison pump recirculating water from the drum to the economizer inlet, supplemented by chemical injection equipment. The pump for this difficult duty has long packings internally water cooled.

The simple and inexpensive blowdown tank is designed to give the flash steam maximum time for separation and no opportunity to pick up again the water separated out. It is a horizontal cylinder with overflow placed to hold some sealing and cooling water, a grating just above the water surface, and a horizontal baffle near the top of the tank to cause the steam after it has traveled the length of the tank to double back to the vent.

The problem in selecting automatic equipment for combustion and other controls is to improve labor and thermal efficiencies without adding upkeep costs and hazards of improper functioning. Therefore well-tried equipment was chosen and special attention given to its arrangement. All the important controls are mounted on individual pedestals on the main operating floor near the instrument and control boards; they are there in continuous view, are accessible from all sides, and may be instantly changed from automatic to manual control.

Pressure-reducing and desuperheating equipment is provided so the new high-pressure boiler may be used to operate the turbines in the old plant.

Temperatures at approximately 60

[*Continued on page 102*]

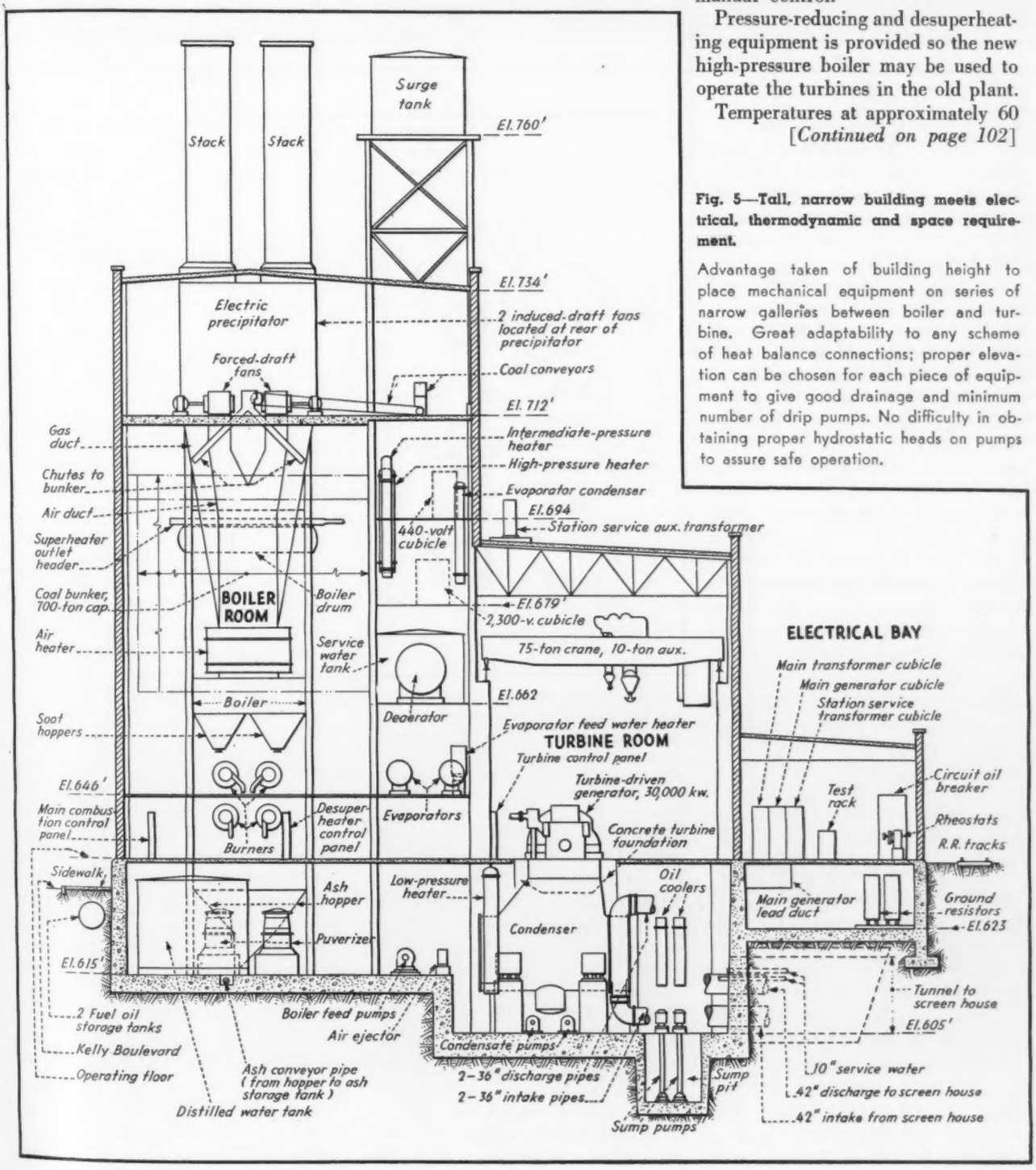



**Fig. 5—Tall, narrow building meets electrical, thermodynamic and space requirement.**

Advantage taken of building height to place mechanical equipment on series of narrow galleries between boiler and turbine. Great adaptability to any scheme of heat balance connections; proper elevation can be chosen for each piece of equipment to give good drainage and minimum number of drip pumps. No difficulty in obtaining proper hydrostatic heads on pumps to assure safe operation.

# Reduce Induction Effects of 66-Kv. Cable

***Normal operation of control system for continuous check on stop joint conditions accomplished by installation of neutralizing transformers and Thyrite resistors to minimize the potential induced by power cable***

C. H. MOORE, *Underground Engineer, Columbia Engineering Corporation, Cincinnati, Ohio*

NEUTRALIZING transformers and "Thyrite" resistors proved effective in reducing to one-third the induction effects of a 66-kv. oil-filled cable upon the adjacent control cable signaling abnormal conditions at the several stop joints.

During 1937 the Cincinnati Gas & Electric Company installed an 8-mile, 66-kv., 500,000-circ.mil, single-conductor, oil-filled cable line from its West End station to Oakley substation. The cable formed a part of the 66-kv. transmission system and was installed in a new conduit system for the entire length of the circuit (Fig. 1).

In order to detect abnormal conditions of oil supply and pressures at the various stop joints along the line a Howe "Autocall" signal system was installed consisting of transmitters located in manholes along the line where stop joints and oil reservoirs are installed and a printometer recording device located in the downtown dispatcher's office. The signal system requires four wires for its operation. These wires, together with spares, were included in a ten-conductor, $\frac{3}{64}$-in. rubber-insulated, lead-covered control cable.

### *Heat Run Disturbances*

The irregular profile of the line required numerous stop joints with accessory equipment, and it was found most practical to install the control cable in the same duct structure with the power cables for the entire length of the circuit.

Due to this long and relatively close exposure, excessive induced voltage in the control cable was anticipated and the problem was discussed with the manufacturers. It was found that the problem did not lend itself to reliable mathematical calculations because of unknown conditions and it was recommended that the control cable have a lead sheath for its shielding effect in reducing voltage in the conductors. After the cables were installed, tests were made that showed the induced voltage to be approximately 20 per cent below calculated values for a non-leaded cable and a further reduction was necessary to permit normal operation of the signal system apparatus during full load or premeditated short-time overload on the power cables.

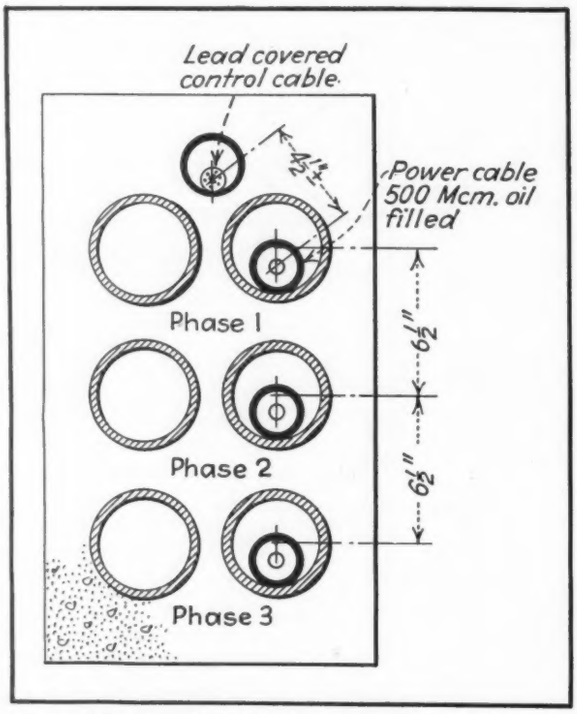



**Fig. 1—Six 4-in. fibre ducts for power cables and one 2-in. fibre duct for a control cable**

The single-conductor power cables were installed in a vertical configuration so joints and oil reservoirs could be arranged in manholes to permit installation of a future circuit with minimum congestion of accessory equipment.

Previous to putting the circuit in service, a heat run test, 650 amp., three phase, at reduced voltage, was imposed on the power cables. During this test signal equipment near the end of the line flashed over, finally causing insulation breakdown that required disconnecting the Autocall system during the high current heat run.

Transposition of the power cables was considered, but this was objectionable because isolation from a future circuit, with its accessory equipment, would be difficult, expensive and congestion of cables would exist in transposition manholes. Also, field tests showed that transpositions would still permit approximately 7,000 volts to be induced in the control cable during certain possible faults on the 66-kv. system. This would cause the signal system to become inoperative when it was most desired, so it was considered preferable to employ other means of protection for the signal system.

Several protective devices were considered and the Cincinnati & Suburban Bell Telephone Company's transmission engineers were consulted to obtain their experience with neutralizing transformers. It was de-

cided finally to install Western Electric neutralizing transformers and General Electric Thyrite resistance units. The neutralizing transformers are intended to reduce induced voltages only during normal or small overloads and the Thyrite resistance units are installed as back-up protection to reduce excessive induced voltages during time of faults on the 66-kv. system.

### *Induced Voltages Subdivided*

Neutralizing transformers connected in a circuit in the manner of Fig. 2 break up the total longitudinal induced voltage and the disturbing voltage may be held within desired limits by installing one or more transformers in a circuit.

The Thyrite resistance units resemble valve action in their operation by drawing increasing amount of current as voltage tends to build up, automatically returning to normal when system disturbances subside.

Two spare conductors in the control cable are used for telephone equipment. Portable handsets are used in the manholes and permanent telephones are located in the dispatcher's office and underground headquarters. The locations of the neutralizing transformers were determined by locating points of balanced induced voltages in the Autocall circuit. This was done by opening the Autocall circuit at two locations and, by use of the portable telephones, simultaneous voltages were measured, finally locating two points in the circuit where a minimum unbalance of induced voltage existed. These tests were made with the control cable conductors ungrounded or floating and some shifting of voltages occurred with changing loads. However, after installation of the neutralizing transformers, grounding the transformer primary circuit had a decided stabilizing effect.

### *Limited Neutralization*

Due to the high resistance (60 ohms resistance to d.c.) of each transformer secondary coil, it was considered impractical and not economical to install a sufficient number of neutralizing transformers to reduce induced voltages to safe values during times of severe faults. The addition of two transformer secondaries in each signal circuit conductor made it necessary to increase the Autocall battery voltage from 130 to 160 volts and the Autocall engineers made some changes in the circuit to insure proper operation of the signal system under all operating conditions.

The neutralizing transformers and Thyrite resistance units have been in operation for approximately ten months and satisfactory operation of the signal system has been experienced.

Since installation of the protective equipment (Fig. 3) remote external faults have occurred on the 66-kv. system that were reflected to a certain extent over the power cables without any apparent effect on the signal system. Recently a lightning flashover occurred on an adjacent line that drew 2,000 amp. per phase, approximately 400 per cent load, over the power cable and caused the printometer to operate indicating trouble in the signal circuit. An immediate check of the signal circuit showed normal, which indicated the Thyrite units had functioned to relieve voltage and had recovered, returning the signal circuit to normal.

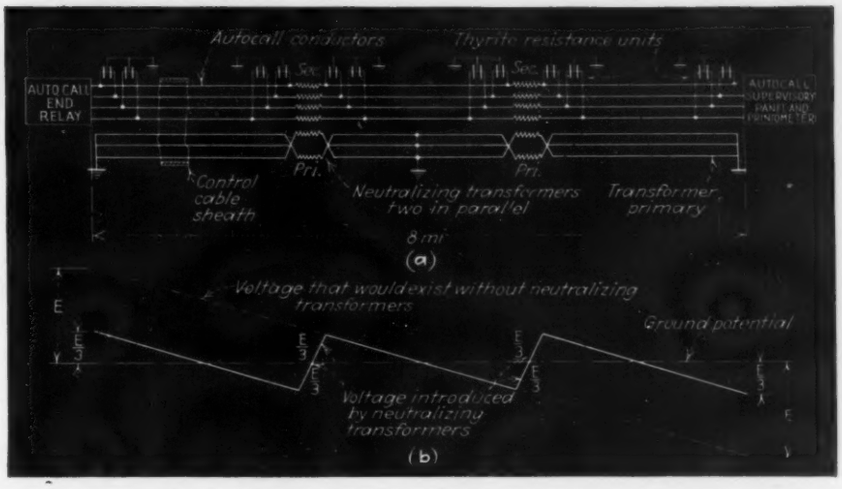



**Fig. 2—Neutralizing transformers and Thyrite resistors reduce induced voltage by two-thirds**

(a) Two installations of neutralizing transformers and Thyrite resistors. The neutralizing transformers used were standard one to one ratio Western Electric indoor type, rated at 4,000 volts, having one primary and two secondary windings on the same magnetic core. Three No. 14 wires in the control cable were connected in parallel for the transformer primary circuit and the transformer secondaries were connected in series in the signal circuit. The Thyrite resistance units have negative resistance characteristics. One of the type units used offers 15,000-ohm resistance to 150-volt d.c., reducing to 115 ohms at 800 volts.

(b) Profile of induced voltage in Autocall circuit. Without neutralizing transformers $E = 250$ volts with 525 amp. in each phase of power cable.

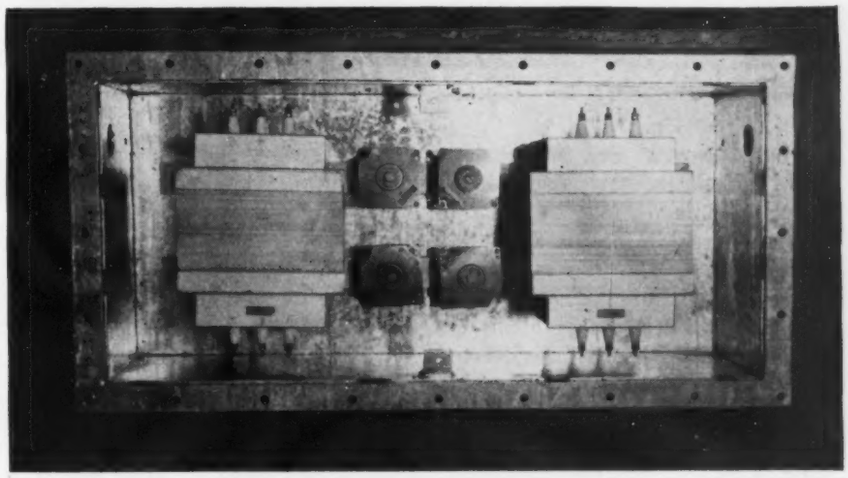
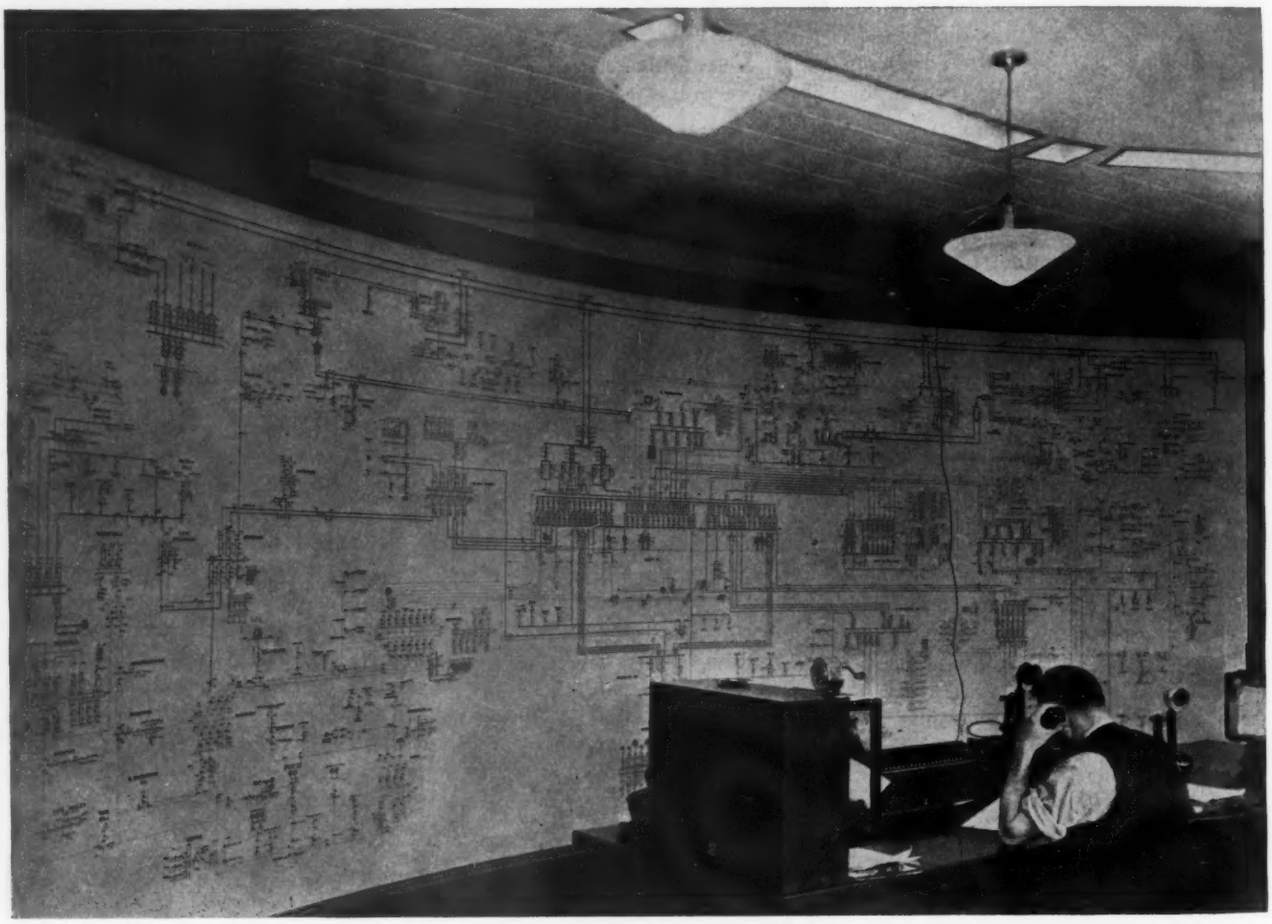


**Fig. 3—Protective equipment housed in water-proof metal boxes**

Each houses two neutralizing transformers and four Thyrite resistance units. The boxes were placed in manholes which divide the circuit in three approximately equal parts.

# ONE-PIECE SURFACE ON

P. L. PETERSON, *New England Power Company, and*
W. S. MOWRY, *Worcester County Electric Company, Worcester, Mass.*



**Lighting unit arrangement for dispatching board, Franklin Square**

IN DESIGNING a new dispatching board for the southern division of the New England Power Association system at Franklin Square substation in Providence, R I., it was planned to use an aluminum sheet to overcome the maintenance problems experienced with boards constructed of plywood. Trouble from checking and cracking has been experienced in a number of cases after a few years of service, and where dispatching boards are made up in several sections, the seams have a tendency to open due to atmospheric changes.

The system diagram covering the equipment controlled from Franklin Square called for a dispatching board 10 ft. high x 24 ft. long. This was laid out on an arc of a circle with an 18 ft. radius, which enables the dispatcher seated near the center of the board to see the entire diagram with no appreciable distortion.

Initially it was planned to construct the face of the board out of an aluminum sheet $\frac{1}{8}$ in. thick and 10 x 18 ft. in dimensions. After checking the architects' prints it was found impossible to get a sheet of this size into the building. It was then decided to use six sheets, each 10 ft. high x 4 ft. wide, welding these electrically inside the building.

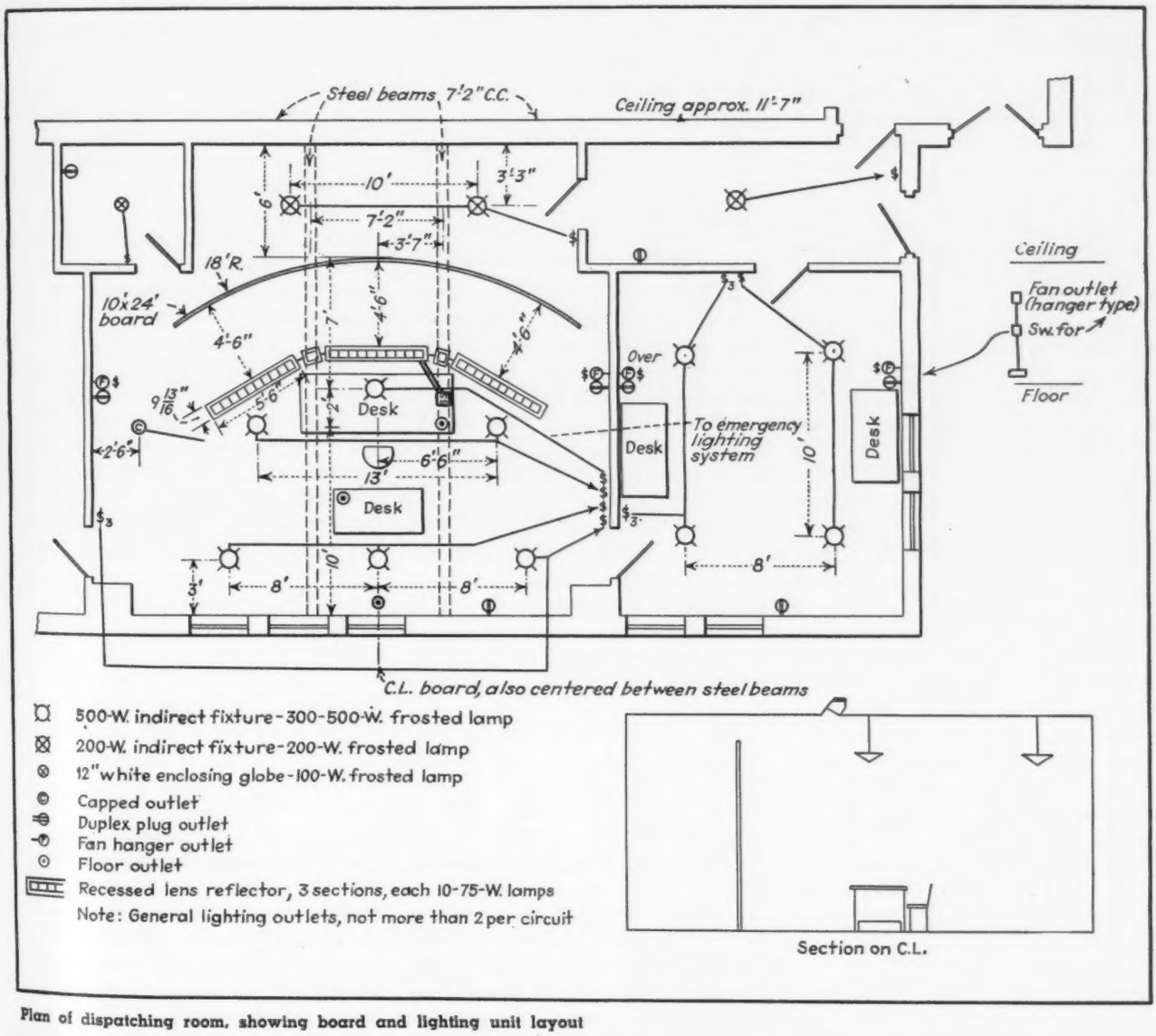
This welding job was the greatest problem encountered. After several welding concerns had stated to us that it would be impossible to weld the aluminum sheets satisfactorily, we located the E. T. Ryan Company of Boston, which felt that the work could be done, and furnished the necessary labor. In welding, the ends of two aluminum sheets were placed on an I-beam and butted to-

# NEW DISPATCHING BOARD

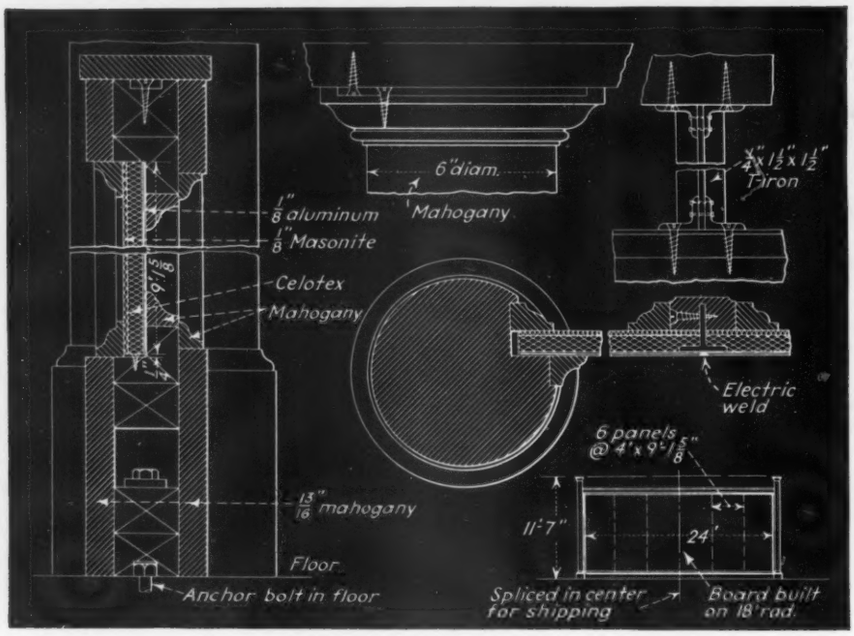
***Aluminum sheet, six pieces welded together to make one continuous face for the board, avoids the cracking, checking and shrinking under atmospheric changes that frequently afflict boards of panel construction — Ingenious lighting scheme illuminates board to 35 foot-candles average***

gether, holding the 10-ft. ends together by constructing two 10-ft. bridge clamps which spanned the width of the sheet. The seam was electrically welded, using a ¼-in. carbon electrode and feeding a ⅛-in. aluminum wire into the arc.

After the welding was completed and the clamps removed, the seam was found to be slightly buckled. It was straightened by hammering and the excess aluminum in the weld was ground off by using a power-driven emery wheel. The welded aluminum sheet was then set in a wooden frame, the upper section of which was bolted to the ceiling and the bottom section bolted to the floor. Since there was no tie between the aluminum and the frame (the frame merely held the aluminum in place) it was necessary to seat the aluminum face on a thin strip of steel set into the wooden frame which was bolted to the floor, which insured that the expansion and contraction of the aluminum face with temperature varia-




**Plan of dispatching room, showing board and lighting unit layout**




**Method of supporting aluminum panels, celotex and masonite backing at Franklin Square**

tions would not result in its wearing itself into the supporting wooden frame.

After being set in place the aluminum surface was sanded with varying grades of emery cloth to roughen the surface for painting. This surface was spray-painted with four coats of quick-drying primer and later spray-painted with four coats of gray eggshell lacquer.

Since small steel pins (diameter 0.060 in.) with varied colored heads are used by the dispatching department to indicate open and closed positions of oil circuit breakers, it was necessary to find some method of holding these pins in place. It was finally decided to install a ½-in. celotex board behind the aluminum face, drilling through the aluminum into the celotex. To hold the celotex lining in place 10-ft. T-iron pieces were installed behind each weld, being held in place by small angle-irons. These T-irons also served as additional supports for the aluminum face. The celotex lining was backed by a ⅛-in. masonite finished board which was clamped in place at each T-iron by a wooden moulding strip fastened by wood screws passing through holes drilled in the T-iron. After the celotex and masonite backing were installed the finished moulding strips were placed in position and the frame finished in mahogany.

The various transmission lines were painted on with oil paints. In drilling the board for the colored indicating pins it was found necessary to grind off some of the cutting edge of the No. 67 gage Brown & Sharpe drills to prevent them from running or breaking. The drill diameter was 0.001 in. larger than the steel pins. The best cutting fluid proved to be turpentine.

### *Lighting Problem Solved*

In all such work as this maximum care is required in planning the lighting installation, essential for complete eye comfort and at the same time quick and easy vision on a task which calls for 24-hours-per-day service. An average intensity of 35 ft.-candles was desired. The background was to be a light gray, with diagram lines and pins in black and colors. Since the ceiling was of a suspended acoustical type, it was felt that advantage should be taken of this space above the ceiling by recessing the equipment and cutting down the heat input as much as possible.

The lighting equipment designed consisted of three 5-ft. 6-in. straight line troughs, located 4 ft. 6 in. from the board at their centers and recessed in the ceiling 11 ft. 6 in. from the floor. The ends of these troughs were to go as close together as two steel beams above the ceiling would permit. These beams were on 7-ft. 6-in. centers and it was later found necessary for even light distribution to supplement the above equipment with two single 150-watt lighting units set in between the ends of each section and under the beams.

Each trough contained ten 6-in. prismatic plates inclined so that their axes intercepted the board half way up, with 100-watt standard lamps turned base up over each lens. No reflectors were used, as the added efficiency was not justified as to cost. Besides, the direct control of light was sufficient with the lenses alone (the Litecontrol Corporation, Boston, furnished the lighting equipment), and the uncontrolled light inside the trough was utilized to spill through and soften the main beam effect on the board. This was later borne out in viewing the shadows of the indicating pins, which were visible, but not dark enough to cause any confusion.

### *"Fanned" Light*

Alternate lamps were positioned in relation to the plate axes so that half the lamps were lighting the upper and lower parts of the board respectively. The board intercepted a vertical angle of 37 deg., so that the divergencies of the two beams were about 18 deg. This called for lamps placed on an offset of ½ to ⅝ in., or an 8 or 10 deg. divergence from normal. This method of fanning the light gave an unusually even illumination on the board, with a maximum variation in values in the ratio of four to three.

For half-light control alternate pairs of lenses can be switched off and still leave an even intensity effect over the whole board. Switching control was provided at the dispatcher's desk.

General room illumination was provided by 300- to 500-watt luminous indirect Ainsworth glass fixtures, three located along an arc 7 ft. from the board with a soft cut-off line along the upper wood frame of the board. Three other units in line, 8 ft. apart, were located parallel to the back wall at a minimum distance of 7 ft. from the curved row and 3 ft. from the wall. The center light nearest the board was connected to the emergency lighting system. Illumination delivered on the desk with board lighting and three general units in service was 35 ft.-candles. The adjacent office was lighted with 300-watt fixtures spaced on 8-ft. x 10-ft. centers, delivering 25 ft.-candles.

# Group Analysis Proves That Meter Accuracies Hold Up

***Conclusions derived from study of some 80,000 watt-hour meter test records are that extensions of test periods could readily be justified by service performances of meters of modern design***

**C. P. STAHL,** *Meter Engineer, Wisconsin Power & Light Company, Madison, Wis.**

PERIODIC electric meter tests show very high percentages of all meters tested to have accuracies within plus or minus 4 per cent limits; installation test results show an extremely high percentage of meters within allowable accuracy limits; age class analysis shows the more modern meters to have superior sustained accuracy characteristics; more meters test slow than fast; results justify extension of test periods, change to ball type bearings for most meters and a program of junking meters more than 25 years old.

These conclusions result from an analysis of reports from major utility systems in Wisconsin of "as found" accuracies of periodic and installation tests made in 1937 on some 80,000 watt-hour meters. The reports showed that the "as found" accuracies taken from the individual test slips agreed quite closely with each other when analyzed on a percentage basis. Consequently, a compilation of all the tests reported was made by cumulating these tests, at it was believed that this would give an accurate indication of the average condition.

Installation tests were analyzed for 48-month period meters only, although these tests were divided to show the results for new meters not previously installed and for meters that had been removed from service and been reinstalled. Periodic tests were analyzed for all 48-month, twelve-month and six-month period tests. These tests were then subdivided and analyzed, according to meter ages, dividing the meters into three classes, A, B and C. Class A meters are those manufactured since 1926, class B those manufactured between 1914 and 1926 and class C those manufactured prior to 1914.

These dates may vary slightly for different makes of meters, but are taken as the average dates for the class. These dividing dates were taken to correspond with meter types involving major changes in designs and characteristics which affect the accuracy or maintenance cost of the meters. The 48-month meters were also divided by manufacturers to show any major differences which may be caused by different designs. Results of all these compilations are shown in the accompanying tables.

### *Within Accuracy Limits*

Table I shows the interesting fact that at light load 96.3 per cent of all 48-month meters checked on periodic test were found within accuracy limits prescribed by the Wisconsin Public Service Commission (plus or minus 4 per cent) and 99.1 per cent at heavy load, while 63.5 per cent were within 1 per cent of perfect accuracy at light load and 73.8 per cent at heavy load. This table also shows that the newer meters have better sustained accuracy at light loads, while the heavy load accuracies do not vary much from those ob-

* Adapted from meter committee report to Wisconsin Utilities Association.

**Table I—Accuracies of Watt-Hour Meters—48-month Test Period**

| Per Cent of Registration | Total Meters | % | Class A Meters | % | Class B Meters | % | Class C Meters | % | Mfg. 1 Meters | % | Mfg. 2 Meters | % | Mfg. 3 Meters | % | Mfg. 4 Meters | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Meters Tested.... | 70,153 | ..... | 16,047 | ..... | 45,087 | ..... | 4,997 | ..... | 2,035 | ..... | 27,497 | ..... | 4,376 | ..... | 31,455 | ..... |
| 99–101% — both loads..... | 41,026 | 58.5 | 10,048 | 62.4 | 26,223 | 58.2 | 2,510 | 50.3 | 1,008 | 49.5 | 16,260 | 59.1 | 1,789 | 40.9 | 19,065 | 60.6 |
| **Light Load** | | | | | | | | | | | | | | | | |
| Less than 99%.... | 16,709 | 23.8 | 3,449 | 21.5 | 10,760 | 23.9 | 1,508 | 30.2 | 409 | 20.2 | 6,991 | 25.4 | 1,229 | 28.1 | 6,808 | 21.7 |
| More than 101%.. | 8,796 | 12.5 | 1,868 | 11.6 | 5,558 | 12.3 | 585 | 11.7 | 458 | 22.5 | 3,017 | 11.0 | 591 | 5.20 | 3,849 | 12.2 |
| Less than 96%.... | 2,261 | 3.22 | 439 | 2.74 | 1,419 | 3.14 | 350 | 7.01 | 52 | 2.67 | 1,127 | 4.10 | 226 | 13.5 | 744 | 2.39 |
| More than 104%.. | 357 | 0.510 | 129 | 0.804 | 175 | 0.388 | 35 | 0.701 | 25 | 1.23 | 136 | 0.497 | 43 | 0.988 | 126 | 0.410 |
| Not recording.... | 103 | 0.148 | 20 | 0.125 | 64 | 0.142 | 6 | 0.120 | 6 | 0.295 | 41 | 0.149 | 5 | 0.116 | 38 | 0.123 |
| 99–101%..... | 44,648 | 63.5 | 10,730 | 66.9 | 28,769 | 63.8 | 2,904 | 58.1 | 1,168 | 57.3 | 17,489 | 63.6 | 2,556 | 58.4 | 20,798 | 66.1 |
| 96–104%..... | 67,535 | 96.3 | 15,479 | 97.5 | 43,493 | 96.5 | 4,612 | 92.3 | 1,958 | 96.1 | 26,234 | 95.4 | 4,107 | 93.8 | 30,585 | 97.2 |
| **Heavy Load** | | | | | | | | | | | | | | | | |
| Less than 99%.... | 7,293 | 10.4 | 1,766 | 11.0 | 4,538 | 10.1 | 777 | 15.5 | 142 | 6.97 | 3,370 | 12.3 | 453 | 10.4 | 3,011 | 9.57 |
| More than 101%.. | 11,078 | 15.8 | 1,805 | 11.2 | 7,286 | 16.2 | 754 | 15.1 | 416 | 20.4 | 3,742 | 13.6 | 652 | 14.9 | 4,917 | 15.7 |
| Less than 96%.... | 346 | 0.493 | 75 | 0.467 | 198 | 0.440 | 52 | 1.02 | 11 | 0.541 | 177 | 0.652 | 26 | 0.603 | 99 | 0.324 |
| More than 104%.. | 270 | 0.385 | 98 | 0.611 | 143 | 0.318 | 20 | 0.400 | 25 | 1.23 | 88 | 0.330 | 34 | 0.784 | 113 | 0.368 |
| Not recording.... | 76 | 0.109 | 15 | 0.093 | 46 | 0.010 | 2 | 0.040 | 5 | 2.46 | 27 | 0.099 | 4 | 0.094 | 27 | 0.08 |
| 99–101%..... | 51,782 | 73.8 | 12,476 | 77.8 | 33,263 | 73.9 | 3,466 | 69.4 | 1,477 | 72.6 | 20,385 | 74.1 | 3,271 | 74.7 | 23,527 | 74.7 |
| 96–104%..... | 69,537 | 99.1 | 15,874 | 98.9 | 44,746 | 99.2 | 4,925 | 98.6 | 1,999 | 98.2 | 27,232 | 99.0 | 4,316 | 98.6 | 31,243 | 99.3 |

**Table II—Accuracies of Watt-Hour Meters—Twelve-Month Test Period**

| Per Cent of Registration | Total Meters | % | Class A Meters | % | Class B Meters | % | Class C Meters | % |
|---|---|---|---|---|---|---|---|---|
| Meters Tested | 4,490 | .... | 1,012 | .... | 2,834 | .... | 62 | .... |
| 99–101% — both loads | 2,777 | 61.7 | 587 | 57.9 | 1,659 | 58.5 | 47 | 75.8 |
| **Light Load** | | | | | | | | |
| Less than 99% | 1,143 | 25.4 | 276 | 27.3 | 811 | 28.6 | 12 | 19.5 |
| Less than 101% | 451 | 10.0 | 103 | 10.2 | 297 | 10.5 | 3 | 4.84 |
| Less than 96% | 184 | 4.10 | 38 | 3.76 | 133 | 4.69 | 2 | 3.26 |
| More than 104% | 15 | 3.34 | 6 | 0.593 | 7 | 0.247 | 0 | 0 |
| Not Recording | 11 | .245 | 5 | 0.494 | 6 | 0.212 | 0 | 0 |
| 99–101% | 2,896 | 64.4 | 633 | 62.5 | 1,726 | 60.8 | 47 | 75.7 |
| 96–104% | 4,291 | 92.6 | 968 | 95.7 | 2,694 | 95.1 | 60 | 96.7 |
| **Heavy Load** | | | | | | | | |
| Less than 99% | 809 | 18.0 | 207 | 20.5 | 581 | 20.5 | 5 | 8.10 |
| More than 101% | 431 | 9.58 | 89 | 8.80 | 301 | 10.6 | 3 | 4.84 |
| Less than 96% | 78 | 1.74 | 25 | 2.47 | 44 | 1.55 | 2 | 3.26 |
| More than 104% | 9 | 0.20 | 1 | 0.099 | 7 | 0.247 | 0 | 0 |
| Not recording | 11 | 0.245 | 5 | 0.494 | 6 | 0.212 | 0 | 0 |
| 99–101% | 3,250 | 72.4 | 716 | 70.7 | 1,952 | 68.9 | 54 | 87.1 |
| 96–104% | 4,403 | 98.1 | 986 | 97.4 | 2,783 | 98.2 | 60 | 96.7 |

**Table III—Accuracies of Watt-Hour Meters—Six-Month Test Period**

| Per Cent of Registration | Total Meters | % | Class A Meters | % | Class B Meters | % | Class C Meters | % |
|---|---|---|---|---|---|---|---|---|
| Meters Tested | 4,782 | .... | 1,343 | .... | 2,868 | .... | 127 | .... |
| 99–101 — both loads | 3,428 | 71.7 | 996 | 74.2 | 1,964 | 68.5 | 97 | 76.4 |
| **Light Load** | | | | | | | | |
| Less than 99% | 889 | 18.6 | 214 | 15.9 | 613 | 21.4 | 19 | 14.9 |
| More than 101% | 396 | 8.29 | 110 | 8.19 | 231 | 8.05 | 8 | 6.30 |
| Less than 96% | 121 | 2.53 | 28 | 2.08 | 84 | 2.93 | 4 | 3.15 |
| More than 104% | 15 | 0.314 | 2 | 0.149 | 6 | 0.209 | 1 | 0.787 |
| Not recording | 8 | 0.167 | 5 | 0.373 | 3 | 0.105 | 0 | 0 |
| 99–101% | 3,497 | 73.1 | 1,019 | 75.9 | 2,024 | 70.6 | 100 | 78.7 |
| 96–104% | 4,646 | 97.2 | 1,313 | 97.9 | 2,778 | 96.9 | 122 | 96.1 |
| **Heavy Load** | | | | | | | | |
| Less than 99% | 564 | 11.8 | 144 | 10.7 | 393 | 13.7 | 5 | 3.94 |
| More than 101% | 370 | 7.75 | 75 | 5.58 | 230 | 8.02 | 9 | 7.08 |
| Less than 96% | 34 | 0.712 | 17 | 1.27 | 16 | 0.558 | 0 | 0 |
| More than 104% | 12 | 0.255 | 2 | 0.149 | 5 | 0.174 | 0 | 0 |
| Not recording | 8 | 0.167 | 5 | 0.373 | 3 | 0.105 | 0 | 0 |
| 99–101% | 3,848 | 80.5 | 1,124 | 83.7 | 2,245 | 78.3 | 113 | 89.0 |
| 96–104% | 4,736 | 99.0 | 1,324 | 98.6 | 2,847 | 99.3 | 127 | 100.0 |

tained for other age classes. This shows an improvement in those factors that decrease friction in the meters, which is an important step in the right direction.

### *Friction Error Largest*

The analysis by manufacturers bears out very well the facts noticed in meter maintenance work. It also justifies the use of ball instead of pivot type jewels, except for one type of pivot using a special alloy, due to better sustained accuracy of the meters using the ball type. It is also of interest to note that at light load approximately twice as many meters are slow than are fast beyond 1 per cent limits, while extremely few meters are more than 4 per cent fast; in fact, only one-half of 1 per cent were so found, while 3.22 per cent were slower than 4 per cent slow. This again shows that one of the largest contributing factors in meter inaccuracies is friction of some type or other and that most items that cause a meter to be inaccurate will cause it to run slow, especially at light load. The accuracies shown, as well as the general tendencies of design to improve sustained accuracy, have led us in Wisconsin to ask for an increase in test period.

Tables II and III bring out some of the same points mentioned above, although not to such a marked degree. The percentage of these meters below 96 per cent registration is higher than for the single-phase meters. This can be attributed in part to the burning out of one element in a two- or three-element meter, which will reduce the accuracy on test, but may not be so apparent in the registration of customer's consumption due to power factor conditions. Also, this class of meter has a generally heavier element than the house type meter and may be subjected to more sudden shocks, with a consequent more rapid deterioration of the jewels. The fact that the older meters do not show up worse than the newer meters can be attributed to the fact that these meters are tested at intervals of twelve months or less.

The analysis brought out very little difference between the accuracies of new meters on installation test and those that have been removed from service and reinstalled. Most of the latter class were tested in the shop before installation. A high percentage of installation tests resulting in accuracies between 96 and 104 per cent (98.3 per cent at light load and 99.5 per cent at full load) was disclosed. This would tend to show that it would not be necessary to make installation tests if the meters are tested in the shop prior to installation. Tests were made by several utilities to determine the effect on accuracy of transportation of meters and it was found negligible.

From the data of Table I a further analysis was made to determine the increase or decrease in revenue obtained by testing, adjusting and maintaining these meters. This analysis was made only for the 48-month meters, as it was thought that the twelve- and six-month meters had too many special applications to allow them to be used with average values.

### *Testing and Revenue*

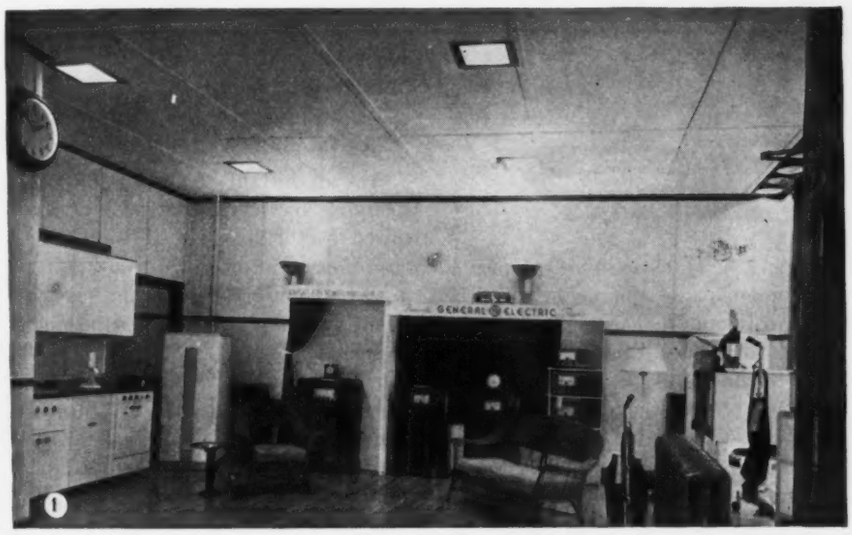
The analysis was made by assuming all meters within any one accuracy bracket to have an accuracy equal to the mean of the limits of the bracket and then averaging these results for light and heavy load tests. This resulted in obtaining a certain percentage of meters at several per cent registration values. An assumption was then made that each meter was measuring the energy usage of an average customer consuming 600 kw.-hr. a year at an average cost of 4 cents per kilowatt hour, or a total annual bill of $24. The loss of revenue due to the slow meters and the gain due to the fast meters was then calculated on this basis and the difference of the two obtained. These amounts were referred to a basis of 1,000 meters for convenience in handling.

These calculations indicated that the average annual increase in revenue per 1,000 tests was $69.49. It must be remembered, however, that these meters are not tested again for four years, so that the amount of increase of revenue for the test period is four times $69.49, or $277.96 per

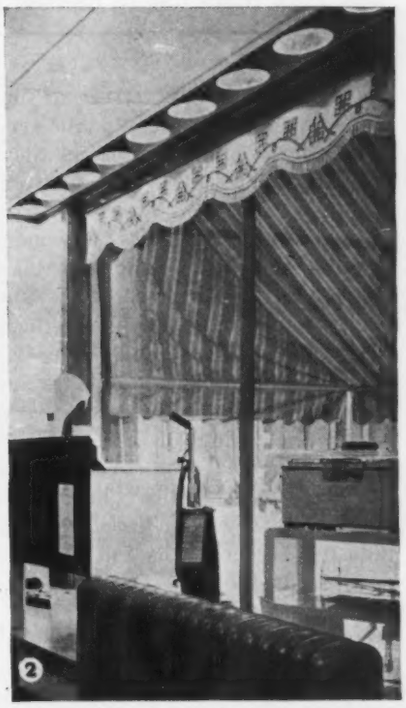
[*Continued on page 101*]

# Relighted Branch Office Sells Light

***Lighting modernization in the Carrollton, Mo., office of Kansas City Power & Light Company, planned by C. G. Turner, utility sales engineer, brought many requests for specifications for relighting local offices and stores***




Appliance showroom (Fig. 1) has Holophane flush units with 12-in. prismatic lenses on 8 and 10-ft. centers which contain 300-watt lamps. Curtis wall urns with 300-watt lamps supplement ceiling units. Intensity on merchandise is about 75 ft.-candles



Windows were modernized in this office with twelve Curtis X-ray "attraction zone" units (Fig. 2), spaced 16 in. and with 200-watt clear lamps. The other window is smaller and has eight units of the same type, spacing and size. Intensity on the window floor is 275 ft.-candles

General office became a better place to work (Fig. 3). Illumination here was raised from 12 to 35 ft.-candles by use of 200-watt lamps in semi-direct Guth units spaced on 8 and 9-ft. centers. Seated at his desk, J. W. Donnigan sees his work clearly with 42 ft.-candles from two indirect Edge-Ray luminaires with 1,000-watt bi-post lamps (Fig. 4)

# Public Service Means Every Aspect of Our Business

***Quality of supply is a major index of dollar value of service, but public attitude is determined more by appearance of plant and system structures, by policies of dealing with people and by characteristics of personnel***

**ALBERT A. CREE**, *President, Central Vermont Public Service Corporation and Twin State Gas & Electric Company, Rutland Vt.*

PROMINENT IN THE TITLE of our company are the words "public service." Many other companies have likewise adopted these two important words as a part of their corporate designation. Sometimes I wonder how deeply most of us appreciate their real significance. How sincerely have we attempted to keep their meaning before us as a guiding star in formulating our policies and doing our job? The essence of service is the doing of useful things for other people. I assume that the words "public service" have been adopted as a generic label for our industry because it is felt that we possess, by the very nature of our business, responsibilities and opportunities for service to the entire social group within the reach of our lines.

Today the business problem which is perhaps provoking greater discussion and greater thought than almost any other by executives in every line of business enterprise is the problem of public relations—good public relations. How to achieve and hold, not just *customer* good will, but real *public* good will, in the face of changing social and political conditions, is a problem which has required and continues to require the most careful thought and the most skillful administrative handling.

### *Cornerstone of Good Will*

We are in the business of supplying electric service to our public. Our first duty, therefore, is to see that our public is supplied with the best electric service that we know how to provide. Let us say, therefore, that responsibility number one falls upon the shoulders of the planning and operating engineers of our

company. Our system planning, maintenance and operation must be constantly and consistently of such quality that such faults as interruptions to the supply of electric energy and variations in voltage to any users, anywhere, are at an absolute minimum.

Our own experience in the territory which we serve has taught us that in many cases where public good will has been temporarily lost or lessened it has not been due necessarily or entirely to any fundamental dissatisfaction with rates, although that is the usual articulate form of expression of public disapproval. The fundamental fact to remember is that any price is too high for a poor product.

### *Case No. 1*

I recall that several years ago there existed in one of the important communities in our territory such a feeling of dissatisfaction, accompanied by general talk within the community about lower prices and the possibilities of acquiring a plant of their own to take over our job. An impartially introspective study of the fundamentals of the service in this community led clearly to the conclusion that restoration of public good will, which we were losing, could not be accomplished simply by the lowering of already reasonable prices, but rather that the service which we were delivering was not up to the standard which the buyers of it had a right to expect in return for *any* price which they paid.

An important transmission line bringing service to that area was exposed to the hazards of long interruptions. The users in that community had suffered interruptions frequently enough to have acquired a justifiable feeling that they weren't getting what they were paying for. Also, it was apparent that the community at large did not like to have its main business streets lighted in a manner which was not in keeping with the standards of some of the neighboring communities of similar size and importance. These, however, were not the things that were talked about; but the curing of these two conditions, coupled with friendly, courteous and frank treatment by the company's manager and employees, brought a truly rapid restoration of public good will and restored to its proper place any consideration of prices for service. Today this community is one of the friendliest ones that we have the pleasure of serving.

### *Case No. 2*

In another case, a few years ago, public dissatisfaction had reached such a point that the citizens of the town had voted to construct their own municipal plant to supply themselves with electricity. On the surface, the reasons expressed for such action were, first, the usual dissatisfaction with prices and, second, the feeling that the community had been dealt with arbitrarily and unsympathetically by the company's representatives. Here, again, an unprejudiced examination of the fun-

damental service situation in the community, an examination made as far as humanly possible through the eyes of the customers, disclosed other reasons for customer and public dissatisfaction which were, in some respects, quite different from those expressed.

### *The Real Reasons*

Under the stress of economic pressure which was sharply felt during the darkest days of the depression, the small company office, which had been maintained in this town for the convenience of its customers, had been discontinued. The company's distribution substation had been allowed to become a rather unsightly and patched-up affair, with inadequate protective fencing around it. It was located adjacent to the back yards of some of the town's citizens with children in their family groups. Loads had grown on some of the distribution lines to such an extent that the quality of service was substantially impaired, since the desire for economy had unduly delayed provision for the necessary increase in the capacity of those lines to keep pace with or ahead of the growing load imposed upon them.

Once these fundamental difficulties were recognized the company immediately, and without waiting for final disposition of the already far advanced plans for the construction of the municipal plant, set to work to remedy them. Lines that were inadequate were reconstructed. A new substation, modern in every respect, with the best protective equipment, was built in a new and better location and the old one dismantled. A new office and showroom made its appearance on the main street of the town, with a spacious demonstration kitchen and meeting hall upstairs which was made available to community organizations which desired to use it for their meetings. A spirit of understanding friendliness in their dealings with the public was instilled into the minds and hearts of the company's employees in that community. At the next regular town meeting the whole matter was put before the voters again and they decisively determined to abandon their thoughts of providing themselves with electric service. Customer and public good will took the place of dissatisfaction and the question of prices was again restored to its proper place as an expression of the cost and value of truly good service. A modest but well-earned adjustment in street-lighting prices was agreed upon and the company assumed a share of the community's cost in connection with the municipal plant investigation.

If a merchant or manufacturer expects to be successful in his business, he must have a real appreciation of the public's desires and needs at all times. It is too easy for us, who are in the business of supplying an essential service to practically every one in our territory, to lose that intimate touch with the customers' wishes which is so vital to the successful conduct of any business.

Neither from the public's point of view nor from the point of view of our own welfare (and really both points of view ought to be the same) can we afford to sit back and wait for the public to bring to us such custom as they desire to give us. We must sell, and in order to sell the kilowatt-hours which are our product, we must get into our customers' hands devices which are necessary to the profitable utilization of our product. It is our duty to all parties having an interest in our business to exert our best efforts toward the sound extension of the use of electrical appliances in the home, for the sound extension of the very practical thesis that better light is desirable in the home, in the schoolroom, the office and the factory, and for the sound extension of the wider and more profitable employment of electric power in industry and on the farm. Therefore, we have tried to build up a selling organization which is, perhaps, not an organization of salesmen in the too commonly accepted sense of that word, but an organization whose purpose it is to know and understand what further use of electricity can be made by customers with benefit to them and to tell those customers about it.

Albert A. Cree

### *Case No. 3*

Not long ago one of our domestic appliance salesmen, who had built up a successful business, was considering the possibility of moving to what looked to him like a more lucrative field of endeavor. One of our customers in his territory took time to write a letter to me pleading that we use our best influence to keep this young man as a salesman because she and her neighbors felt that he was doing a highly serviceable job for them and they wanted him to remain. That is an illustration of the public effect of the kind of selling which it is our policy to encourage, not only on the part of those employees who are labeled as members of the selling organization, but on the part of every officer and employee, no matter what his position may be.

### *Utility Citizenship*

Another of the very important duties of an electric service company is to be a good citizen in its community—a leading citizen in its community. Our officers, local managers and employees everywhere are encouraged and urged to take a sincerely active part in all civic movements of merit. At the present time we have in our organization three presidents of local Chambers of Commerce and the president of the Chamber of Commerce of the state. Others serve on the boards and committees of local Chambers of Commerce or Boards of Trade. Community drives for worth-while projects or organizations are frequently headed by men from our organization. If this kind of work is sincere, then such posts are not taken just as "figurehead" positions. Such a policy, springing from the hearts

[*Continued on page 102*]

# Outdoor Station Housed Indoors in Home Area

*Automatic reclosing on 33-kv. feeders gives reliability of supply — Control energy taken from line sides of breakers — Synchronizing relay prevents any out-of-phase connection*

J. COLEMAN JONES, *Superintendent of Transmission Florida Power & Light Company, Fort Pierce*

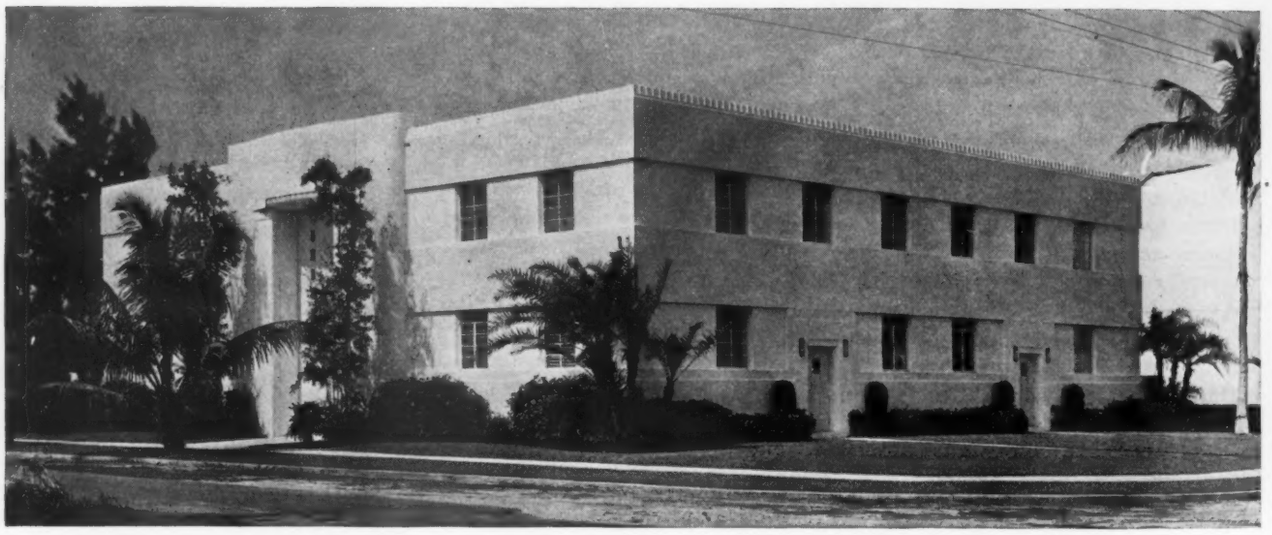


**Fig. 1—Substation harmonizes with Miami Beach environment—Within a short time after construction work had been completed the entire property presented the appearance of having been improved for several years**

ZONING RESTRICTIONS curtail the number of sites available in Miami Beach for increased substation facilities. Consequently the Florida Power & Light Company gave architectural treatment (Fig. 1) to building and grounds in a new substation located on 40th Street in a residential area.

For the sake of parts interchangeability and facilitated maintenance outdoor substation equipment of design predominating elsewhere on the system was installed in the harmoniously designed building. More than ordinary precautions were taken to insure continuity of service, especially for the night life in this resort community.

An outdoor type of substation was designed for this indoor installation (Fig. 2) since the cost of outdoor equipment was comparable to that of indoor equipment. Indoor type low-tension oil circuit breakers with switchboard panels were used, however, as these were available. For using outdoor design indoors major consideration was given to the matter of clearances and protection against oil fires.

### *Sloping Floor*

Vertical clearance over the high point of the disconnects was made 5½ ft. at the nearest approach to the concrete roof beams, since these air-break switches are only required to break charging currents. As for any difference in possible fire hazard, this was met by sloping the floor toward a central concrete sump of sufficient capacity to hold the oil from the largest piece of oil-filled equipment. This sump can be sealed to smother a fire.

Of possible alternatives it was decided that the most reliable and practical installation for the first 6,000 kva. was to loop one of the two available 33-kv. transmission circuits through the substation bus. In both incoming lines single-conductor, lead-covered cable was run into the bus from the terminal poles and 33-kv. oil circuit breakers. As an added precaution toward restoring service in the event of extreme trouble, disconnects were installed (Fig. 3) in the second transmission circuit; thus the jumpers can be removed between the cables and the normally used circuit and shifted to the second circuit for temporary operation.

Since the transmission circuit which serves the substation is a part of the loop serving the entire Miami area, it was essential that reliable

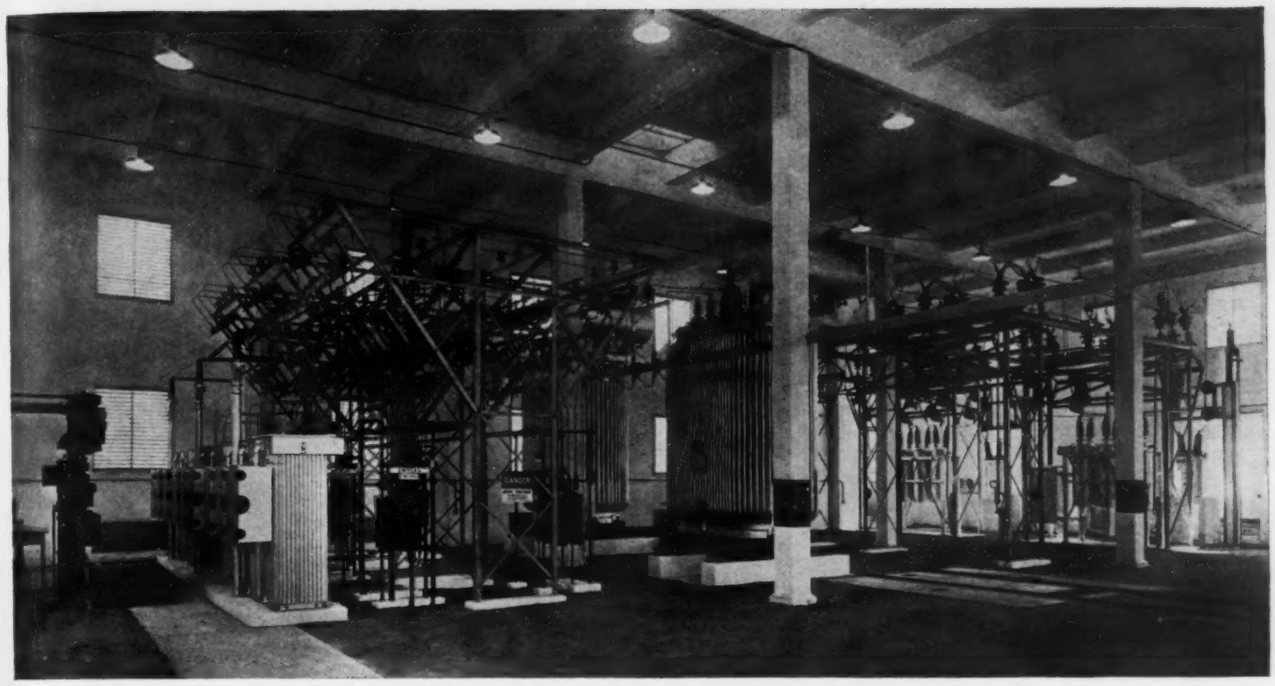


**Fig. 2—Outdoor design given "indoor" housing—Only half the total floor space (80x91 ft.) is used for the initial 6,000 kva. of capacity**

automatic reclosing features be included in the high-tension oil circuit breaker installation. The oil circuit breakers were, therefore, equipped with directional overload relays and closing power obtained from two 10-kva., 33-kv. transformers, one connected on the line side of the oil circuit breaker on each incoming line.

These transformers supply power for closing the alternating current rectifier operated mechanisms as well as for operating the control relays. The operation is so arranged that when the transmission circuit relays on either side of the substation the line will be re-energized from the other end by operators in regular attendance. The line transformer is thereby energized, which sets into operation a synchronizing relay with a time delay of approximately fifteen seconds.

This synchronizing relay was installed (Fig. 3) since there is a remote possibility that the system might be so separated that two separate systems would be tied together by closing the oil circuit breaker.

Three feeders served through 4,000-volt automatic reclosing oil circuit breakers with instantaneous initial reclosure and 300-600-amp. self-contained outdoor type regulators are connected to the 4,000-volt bus for service to the distribution area.

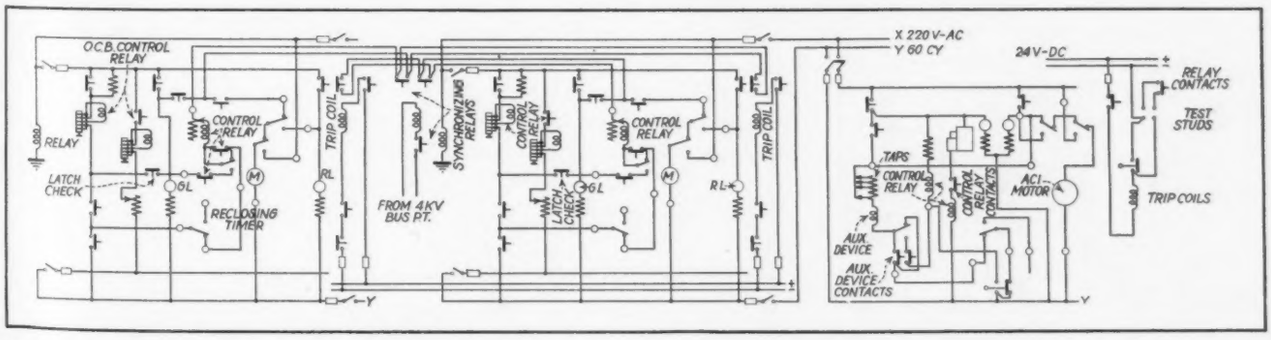



**Fig. 3—Synchronizing relay introduces 15-second delay**

The synchronizing relay operates an instantaneous auxiliary relay, which in turn closes the oil circuit breaker through a reclosing relay set for three reclosures, with the initial one instantaneous. This relay was installed to lock out the oil circuit breaker to prevent pumping in case trouble is experienced with the latching mechanism of the breaker.

Auxiliary switches on the oil circuit breakers were cross-connected so that in event of improper operation of the directional relays, causing both oil circuit breakers to trip out, the closing auxiliary relay will be by-passed to allow the oil circuit breaker on the section of the line first energized to close. Without this provision the synchronizing relay would fail to close due to lack of bus potential for one synchronizing voltage and neither oil circuit breaker would close.

Additional double-throw knife switches were installed in the power control circuit for each oil circuit breaker so that the control source can be changed to a 4,000-volt transformer connected to the substation bus. This was done in order to provide a closing source for the oil circuit breaker on the north in case the line is sectionalized for maintenance work and the next substation is served through this oil circuit breaker.

Tripping power for both high- and low-tension oil circuit breakers is supplied from a control type, 24-volt storage battery equipped with necessary charging devices.

# Editorials

S. B. WILLIAMS, *Editor*

## *Smyth vs. Ames Given New Life*

SMYTH VERSUS AMES still stands as the formula for determining fair value in utility rate making. In an appeal to the Supreme Court from an injunction by a federal district court against the enforcement of temporary rates by Edison Light & Power Company, the Pennsylvania Public Utility Commission was joined by the Solicitor-General of the United States and others as friends of the court in a plea that the "prudent investment" theory be substituted for the "fair value" formula of Smyth vs. Ames.

The Supreme Court, while reversing the lower court decree, did not find any necessity for considering what rightly constituted fair value, inasmuch as the commission in setting the rates had given weight to reproduction cost, original cost, going concern value and the necessity for working capital.

The Pennsylvania commission had interpreted the statute to mean that it must weigh all essential elements of valuation and the court held that nothing in the section under dispute "requires a different construction." And thus the court held to the old rule of not deciding issues of constitutionality if the case may be decided "under a construction of the statute under which the act is clearly constitutional."

It would be difficult to see in the opinion that the court took any position with respect to what constitutes value were it not for a concurring but separate opinion by Justice Frankfurter and Black, which held that the decision "appears to give new vitality needlessly to the mischievous formula for fixing utility rates in Smyth vs. Ames," and later on, "The court's opinion in the present case does not avoid issues of constitutionality. It accepts the much more dubious constitutional doctrines of Smyth vs. Ames and its successors to solve the very easy constitutional issues raised by the Pennsylvania Act."

This case was the strongest assault so far by the proponents of "prudent investment" against the "fair value" theory of Smyth vs. Ames. For that reason the decision of the court is of greater significance.

The decision at the same time might be construed as giving a green light to the principle of temporary rate reductions that set up reasonable values and are not confiscatory as to return.

## *Are Transformer Taps Needed?*

IN THE incessant drive for lowered distribution costs not even the small items can afford to be overlookd, and this includes the question of transformer taps. Are they needed in conventional transformers under present conditions or are they merely a holdover from a past era? Possibly critical investigation would reveal that they should only be supplied on special order.

Two decades ago taps were an almost indispensable means of compensating for drop in primary voltage with remoteness of load (high taps for the distant load), which was in those days almost all dusk and evening lighting. Voltage variations with the changes of load had not come to be any substantial worry. The steady evolution of regulating equipment has provided the means for meeting the more refined voltage demands of modern appliances and lighting. More than that, the several available forms of out-on-the-line regulators have afforded a much more usable substitute for taps in transformers, the tapped transformers released being available for service in areas scheduled for later attack.

In fact, some companies have been buying for years no transformers smaller than 25 kva. with taps. One big gain is the elimination of the chance that delta banks may have one or more units connected for wrong ratio. A smaller one is trimmer design and the elimination of some internal hazards. The E.E.I. members of a joint E.E.I.-N.E.M.A. committee analyzing this situation queried utilities using 2,400- and 4,800-volt transformers and found that 80 per cent of 69 who replied prefer transformers without taps, 14 per cent want them for logical reasons and 6 per cent want them for an undisclosed reason, if any.

Such facts in the light of the present state of the art of voltage regulation raise definitely the question whether the wants of 20 per cent should fix one minor element in the cost of transformers for the other 80 per cent or whether they should not be special and listed as an extra. The guess has been hazarded that provision of taps, largely unused, costs the industry an extra $500,000 a year, and this is worth saving. An unfortunate aspect of the situation is that many who now use the taps primarily to perpetuate the obsoleting 18/1 ration are wasting in unused capacity a corresponding amount of money that could well be devoted to modern regulating devices. The regulating devices do a better all-round job than taps—taps can only boost—under today's call for service to appliance and lighting loads, which demand well-ordered voltage.

## *Bargain Package Campaigns*

THE EYES of the entire utility industry are focused upon the residential load-building activities in New York City —package campaigns at greatly reduced prices and now refrigerators at reduced prices and long terms.

The record shows an amazing volume of sales, but it does not show at what cost, everything considered. Nor does the record show the results in load building, or by classes. Based on data from an earlier campaign, an estimated added consumption per package of 150 kw.-hr. is indicated which if applied generally would make an increase in revenue of approximately $1,850,000 annually.

Results such as these are bound to make executives wonder if perhaps their own sales departments might not be passing up something worth while. Before making any decision, however, more should be known of the New York plan and of New York itself. What might be good for the country's largest city might not be good for other cities, large or small.

In the first place, a large part of the people of New York live in rented apartments. Moreover, these apartments are small and getting smaller. Because of neighborhood food stores, there is a downward trend in cooking. Likewise, because of widespread entertainment facilities, there is less inclination to stay at home nights. The energy consumption, therefore, of this type of customer has been low. And because only a portion live on ground floors ranges and water heaters, because of wiring, are out. Moreover, New York had a large rate reduction which materially increased the number of non-profitable customers. Whatever could be done had to get results quickly and not take the normal path of the long pull.

The plan itself is based upon a real bargain-price appeal. The manufacturer had to make a lower price, the dealer a lower mark-up and the utility had to spend a substantial sum in promotion.

The cost, however, is more than the money spent, it must include the disruption of normal channels of distribution. There is substituted for the dealer a different profit method. This is interference which the dealer does not like. He may feel that he has to go along or have his market cut out from under him during the sale. But that may be a rather high price to pay for load.

In fact, the National Retail Dry Goods Association is suggesting that the trend of interference with dealer business may result in another revolt such as gave rise a few years ago to anti-merchandising bills.

Plans that upset the normal channels of distribution must have more to justify them than merely the natural desire to build load. Before taking such a course, one should be sure that the present situation is so precarious that no other way will take one out of the predicament.

For several years the utilities have encouraged the dealers with mutual profit. To jeopardize this load-building asset as well as the good will would be a mistake at this time, when both are so very much needed.

## *All-Employee Selling Runs Afoul of Wage and Hour Act*

NEW DEAL legislation has caused many modifications to utility operations, and now another old favorite seems destined to come to an end—all employee selling of appliances and lamp bulbs.

Under the Wage and Hour Act employees must be compensated for the time they work and receive overtime when they work more than 44 hours a week. It will be argued that employees selling lamps and appliances after hours do so voluntarily and on a commission basis. That appears to be immaterial if they do it with the knowledge of the company.

Not all utilities engage in all-employee selling. The trend, if anything, has been away from that practice in favor of better dealer relations. Nevertheless, in some properties that have achieved national leadership for residential usage no small part of the credit is due to all-employee selling campaigns.

But whether these campaigns have always been as fruitful of results as some other activity would have been, it cannot be forgotten that employees were contacting the public and selling the company. This did have a certain employee relations value.

And so another old friend who so often has been of help in times of need passes on.


# REMEMBER!

May first is the last day for acceptance of entries in the ELECTRICAL WORLD's Prize Picture Contest. Entries must be in the New York office of the ELECTRICAL WORLD on May first in order to be eligible for the contest.

# Health Takes a Hand

By CARTER FIELD

*This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him*

PERHAPS the most important single factor to the electric industry, and, in fact, to business generally, in the whole Washington setup is the state of health of Secretary Harry L. Hopkins. It is beginning to be obvious that in the whole so-called appeasement program it was Hopkins, and Hopkins alone, who could translate his ideas as to what should be done to encourage business into affirmative action by the President.

Mr. Hopkins' program for unshackling business was ambitious. It was tremendously encouraging. In fact, it was the first sunshine from within the ranks of the powers that be in Washington—if one excepts a few mirages—for six long years. As unfolded to individual senators, and to certain gentlemen having influence with the Senate, it had many ramifications.

It was especially encouraging because it seemed to have sound political logic back of it, and Mr. Hopkins gave all and sundry to understand that the President approved both the political logic and the necessary steps involved. It looked, in short, to bringing about a real revival of business which should reach full flood before the election to be held in November, 1940.

### *TVA Settlement*

The very first step of this program, as Hopkins painted the picture, was to stop the scrap with the electric industry—to have TVA pay a fair price for the Tennessee properties, and to take other steps which would release that piled up spending which fear of government has been restraining.

The first step of this program was taken so quickly that the whole country was amazed. The next step followed logically last week, with the announced play by TVA to eliminate one factor which has made the very suggestion of the "yardstick" ridiculous. It announces not only that the TVA properties will pay a more adequate sum, in lieu of the taxes privately owned utilities would pay, to the state and local governments in which it operates, but that it will consider a return also to the federal treasury to compensate for the taxes private electric companies would pay on the same operations to the national government.

It is unlikely that this will be adequate. Probably no consideration will be given to the individual income taxes which Washington would receive from security holders of electric companies. Or that the federal government will get half enough even to pay interest on the cost of construction—and purchase—of the properties. But at least it is a start.

Incidentally, the very text of the statement of April 13—put out officially by TVA—should, to put it mildly, make the faces of the six Democrats and one Republican on the TVA investigating committee who signed the majority report slightly pink. It may be remembered that even Vic Donahey, who presumably owes the President and the New Deal nothing, signed that remarkable document, including a statement that the yardstick was sound.

"The committee," said that majority report, "after carefully considering the wealth of evidence on the subject, concludes that by cost charges and accounting methods applicable to private industry, the electric rates of the Authority provide a legitimate, honest yardstick of equitable rates of private industry."

Incidentally, there are those who think that had Vic Donahey refused to sign that majority report, and made a separate report of his own, there might have been significant repercussions. Let's imagine, for example, that Donahey had said something like this: "I agree with most of the majority report. We did not find any evidence of graft, and such evidences of bad business judgment as we found are mere flyspecks on such a huge venture. But the yardstick, as generally understood, is absurd. David E. Lilienthal himself testified that the government has certain inherent advantages—that it can charge off large parts of the cost to navigation and flood control, which private companies cannot do; that it can borrow money on tax exempt bonds at 2 per cent, while private companies have to pay much more, and that its contributions in lieu of taxes are far less than private companies have to pay."

Lest any one be deceived, Senator Donahey said nothing of the sort. He merely signed the misleading majority report.

What happened? Most people have forgotten Donahey was on the committee. What could have happened? Donahey comes from the vitally important state of Ohio, with 26 electoral votes. His minority report would have been tremendous news. The New Dealers would have raved, but their anger in the very nature of things must have laid as much against Lilienthal as against Donahey, and Lilienthal is the darling of George Norris and the whole public power crowd.

### *Nothing Since Confirmation*

But Harry Hopkins had paid some attention to Lilienthal's testimony, even if Donahey disregarded it. Which brings us back to what comes next in the Hopkins program.

That's where the importance of Hopkins' health is concerned. Actually TVA developments resulting from Hopkins' activity *before* confirmation by the Senate are the only steps in the appeasement program which have been taken. Hopkins has done nothing since he took office for the simple reason that he has been a sick man. A very sick man.

Close friends of Hopkins say his recent remarks about having only a year in which to accomplish certain things are more significant than has been generally understood; that he may be obliged to return to Roches-

[*Continued on page 99*]

# NEWS OF THE WEEK

## Supreme Court Upholds "Fair Value" Doctrine

***Justice Reed delivers decision holding Pennsylvania temporary rate slash is constitutional in Edison Light & Power case — Government had asked for prudent investment procedure***

A sharp setback to proponents of a "streamlined" system of utility rate making with the rejection of the prudent investment theory was seen this week in the decision of the United States Supreme Court which upheld the fair value procedure.

The court upheld the constitutionality of a Pennsylvania statute permitting the state utility commission to set temporary rates. Edison Light & Power Co. of York, Pa., had attacked the order of the commission reducing rates $435,000 and had obtained a decree of a three-judge district court granting a permanent injunction against the enforcement of temporary rates. The lower court was reversed.

### *Allows 6% Return*

The majority decision, delivered by Justice Reed, recent appointee of President Roosevelt, found that the commission had taken into consideration, in valuing the utility's property, the elements of original cost, reproduction cost, going concern value and the necessity for working capital, and allowed on this rate base a return of more than 6 per cent.

Because the commission had considered these elements, and not confined itself to original cost less depreciation, the court found that the rate reduction order did not (1) violate procedural requirements of "due process"; (2) fail to permit the utility to earn a fair return on the fair value of its property; (3) confiscate the company's property.

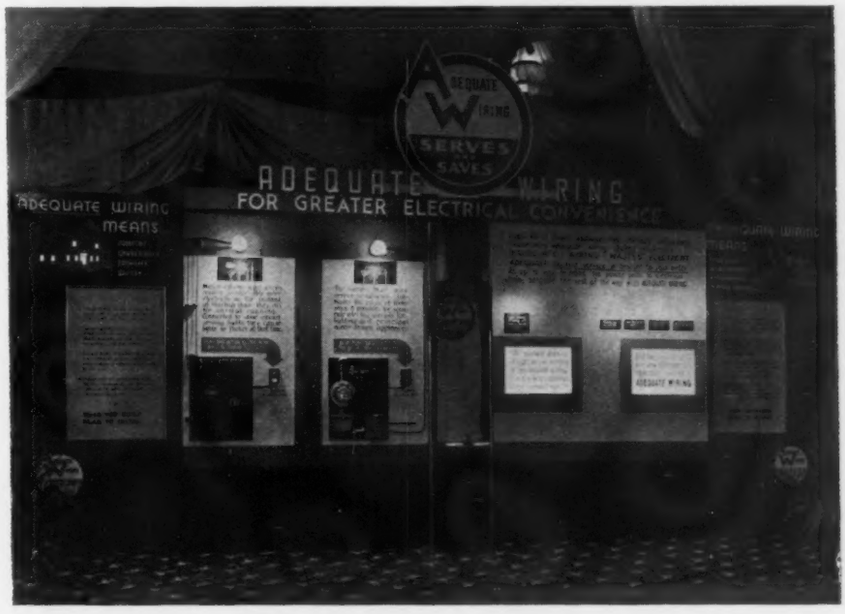
Justice Frankfurter, joined by Justice Black, dissented from the majority opinion and held that the majority decision appeared "to give new vitality needlessly to the mischievous formula for fixing utility rates in Smyth vs. Ames. The force of reason, confirmed by events, has gradually been rendering that formula moribund by revealing it to be useless as a guide for adjudication."

Justice Frankfurter stated that Smyth vs. Ames should certainly not be invoked when it is not necessary to do so. He said that the present case was one which represents efforts to escape it, at least as to temporary rates.

### *Urged Prudent Investment*

While the utility did not present its case as a fit one to test the rule on the Smyth vs. Ames doctrine as against new ones recently advocated, yet Solicitor-General Robert H. Jackson filed a government brief asking the court to hold that prudent investment "is the standard for rate making best adapted to modern business conditions and practice in this country." Mr. Jackson had argued that the "rule of fair value" has resulted in a breakdown of the process of rate regulation.

The majority decision went into some details in examining the company's records before concluding that the rate reduction did not amount to confiscation. It held that "it must be recognized that each utility presents an individual problem." It found that a 6




**ADEQUATE WIRING—This striking display of adequate wiring was the center of attraction at the recent seventh annual Electrical Progress Exposition sponsored by the Cincinnati Electrical Association and the Cincinnati *Times-Star***

**ANNUAL MEETING—Alfred H. Schoellkopf, president of Niagara Hudson Power, giving an account of the company's operations during 1938 at the annual meeting of stockholders last week. L. to r.—Earle J. Machold, attorney; Charles A. Tattersall, secretary; Floyd L. Carlisle, chairman, and Mr. Schoellkopf**

per cent return was fair. The utility was allowed its fair and proper expenses for presenting its side to the commission, even, as the court said, "where the rates in effect are excessive."

New Dealers, who had backed President Roosevelt in his stand for prudent investment, saw some comfort in that the Pennsylvania commission had not relied entirely upon original cost in setting the new rates.

Opinion in utility circles was that had the court upset the "fair value" doctrine a wave of rate litigation would have swept the country and present values of utility property would come under attack as a means of forcing a lower rate base and a slash in rates.

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## Asks Teachers to Combat Drive Against Business

Teachers were advised to take an active part in combating the current "campaign of misrepresentation" against business in a recent address by Horace P. Liversidge, president of the Philadelphia Electric Co. Speaking before 1,200 educators and administrators at the ninth annual convention of the New York State Vocational Association at the Hotel Pennsylvania, New York, Mr. Liversidge said the youth of today is confronted with a flood of oral and written attacks on business—criticisms of its policies and denunciations of its principles.

Business men of today are more conscious than ever before of their responsibility to society at large, Mr. Liversidge pointed out. They see themselves as trustees for the joint interest of the four parties recognized as essential components of present-day business—workers, stockholders, customers and the public.

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## SEC Staff Members Plan to Quit Posts

Three members of the SEC staff who have been connected with utility procedure have announced their intention of resigning, according to reports. C. Roy Smith, director of the public utility division, has announced his intention of resigning during the summer to return to private law practice. On July 1 he will have been with the SEC for three years.

Abe Fortas, assistant director of the utilities division, has tendered his resignation. It is reported that Mr. Fortas will become chief counsel of the PWA.

Lewis A. Pettit, Jr., of the utilities division, submitted his resignation, effective June 1. Mr. Pettit is said to have referred to his long term of service with the SEC and to have mentioned the advantageous offer to go into private business.

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## E. G. Ralston Dies

Emmet G. Ralston, vice-president and general manager of the Indianapolis Power & Light Co., Indianapolis, Ind., died April 17.

## Business Revival Would Aid Utilities

An increase in earning power of the electric utility industry and a revival of its ability to provide for expansion through equity financing would follow a restoration of the European situation to a peaceful basis, Floyd L. Carlisle, chairman of Niagara Hudson Power Corp., told stockholders at their annual meeting last week.

Mr. Carlisle said that "I do not believe any one would hazard a prophecy as to how it would affect the power business should a European war break out." He said that the power industry is experiencing a sharp increase in power output and has facilities for production of substantially more power.

Upon restoration of normal business in this country, Mr. Carlisle said, the utility industry should be able to show earnings comparable with the good years of the past. The fact that investors would not risk their savings in new enterprises or expansion of present ones was pointed out as one reason why business is going through difficult times. Removal of restrictions causing this "damming up of capital" would lead to prosperity.

Alfred H. Schoellkopf, president, said that the company is proceeding with the construction of the Oswego steam plant and that it will be the last word in efficiency of operation. He said that the cost of equipment is less than had been originally estimated. The plant will be ready in the fall of 1940.

John L. Haley, president of Central New York Power Corp., was elected a director. Other directors were re-elected.

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## Dr. Hirshfeld Dies

Dr. C. F. Hirshfeld, chief of research of Detroit Edison Co. since 1913, died suddenly at Grace Hospital, April 19, after an illness of several months. Dr. Hirshfeld was an internationally known educator and engineer and was the recipient of many honors.

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## Co-op Uses Honor System

Announcement has been made by J. B. Whitehead, project superintendent, that electricity users on the Benton County (Washington) rural electrification system will read their own meters, figure out their own bills and pay by money order to their postman. The plan, which became effective this month, is expected to save $1,200 in the once-a-year-reading along the more than 100 miles of line.

# Budget of Associated Gas Tops 1938 Expenditures

***Most of work will be improvement to existing facilities and extension of transmission and distribution systems— System spent $200,000,000 in ten years***

Operating companies in the Associated Gas & Electric System have spent more than $200,000,000 in the past ten years on new construction and improvements to facilities. Construction budgets this year will be somewhat higher than in 1938, when $14,048,000 was spent.

Last year New York State Electric & Gas Corp. and Rochester Gas & Electric Corp. did the largest amount of work. The major expenditures for New York State Electric & Gas were for work on projects carried over from 1937. These included completion of the construction of the 20,000-kw. generating plant and substation at Dresden,, N. Y., a transmission line between Montour Falls and Geneva and a frequency change in the area around Lancaster. New work included construction of a power supply line and a substation in the Liberty area.

*Adds New Unit*

Work by the Rochester utility included the completion of a third unit for Station No. 3. Installation of a 250,000 lb. per-hour boiler and accessories and the installation of a General Electric 25,000-kw., 80 per cent power factor, 11,000-volt turbo-generator with surface condenser and accessories, operating at 750 lb. and 775 deg. F. was made.

Other important work during the year in the system was construction of a transmission line interconnecting Georgia Power & Light Co. and Georgia Power Co., subsidiary of Commonwealth & Southern. Work involving the installation of a 15,000-kw. turbine in the West Reading plant of Metropolitan Edison Co. was also continued during 1938. New boilers for the Seward plant of the Pennsylvania Electric Co. were installed. Another major expenditure during the year was the purchase of 52 buses for Staten Island Coach Co.

New York State Electric & Gas, the largest operating unit in the Associated Gas System, will in 1939 top all other units in construction expenditures. While no major projects will be undertaken many improvements will be made to existing facilities. Principal items will be substations and transmission and distribution lines.

Construction expenditures this year are only about one-third of what was spent in 1929. During the past ten years the Associated System has spent $14,048,000 in 1938, $26,311,000 in 1937, $17,624,000 in 1936, $11,699,000 in 1935, $7,824,000 in 1934, $6,200,000 in 1933, $6,438,000 in 1932, $24,274,000 in 1931, $38,788,000 in 1930 and $45,867,000 in 1929.

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## State to Oppose Yadkin Power Plan

North Carolina plans to challenge the Federal Power Commission's authority over power projects on the Yadkin River wholly within the state. Judging from official statements made by Gov. Clyde R. Hoey the state will oppose the construction of the High Point hydro project.

The FPC has ruled that the Yadkin is navigable and under commission jurisdiction. High Point has been issued a license to construct a $6,000,000 hydro project, using PWA funds.

Taxpayers and commissioners of the upstream county have entered suit to prevent High Point from condemning land for the proposed reservoir. The city contends that the FPC gave it authority to condemn. Governor Hoey declares that this raises the issue of state's rights and that North Carolina will enter as joint plaintiff with the county to determine whether the federal government or the state has control of streams entirely within the borders of the state and impossible of navigation.

Last year the FPC ruled Yadkin was navigable and the Aluminum Company of America must secure a license for a hydro project. The company abandoned the project without taking the issue into the courts.

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## Restrict Use of Power During Shortage Crisis

The present shortage of electric power in Mexico City has brought about a number of industrial and labor problems. The shortage is due to lack of sufficient rainfall last year and the refusal of the British-owned Mexican Electric Light & Power Co. to enlarge its plants and facilities to meet such a crisis as now exists.

The utility has resisted efforts of the government made to induce the company to enlarge its plant facilities on the grounds that Mexico did not offer sufficient guarantees for such additional investment. Restrictions have been placed on the use of electricity in an effort to economize energy for necessary purposes. It is expected that restrictions will remain in force until the coming rainy season has replenished the water supply of the main power plant.

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## REA to Build Power Plant in Wisconsin

Following strong representations by local rural electrification leaders, REA has allotted $1,000,000 additional to the Tri-State Power Co-operative of Wisconsin, making $1,500,000 available for immediate construction of a generating plant in southwestern Wisconsin. REA also approved preliminary engineering plans for the generating plant. The allotment covers the estimated cost of the generating plant and transmission lines and $50,000 for initial operating expense.

The plant will be built south of La Crosse. It will be a steam plant, with two high-pressure turbines initially and provision for adding other units later.

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## Condemnation Suit Filed

First condemnation suit to acquire eastern Washington right-of-way for the power line to link Bonneville and Grand Coulee dams has been filed in Spokane in the U. S. District Court recently. Judge J. Stanley Webster promptly signed an order transferring title to unoccupied land to the government immediately, with title to occupy parcels to be changed before June 1.

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## New Business Added by West Penn Power

Results of indirect promotion of residential business of West Penn Power Co. through assisting sales by appliance dealers by means of advertising and other forms of promotion were gratifying during 1938, H. L. Mitchell, president, states in the annual report to stockholders. Mr. Mitchell said that 1938 was the first year in which results of the present plan of the company, to assist dealers rather than sell appliances itself, could be compared with former activities. The company

discontinued the sale of appliances by its subsidiary at the end of 1937.

During 1938 dealer sales surpassed all previous records. Dealers sold 2,085 ranges, 233 water heaters, 1,660 roasters and 11,549 I.E.S. lamps, as compared with 498 range, ten water heaters, 250 roasters and 1,000 I.E.S. lamps in 1937.

Mr. Mitchell said that new-business activities during 1938 produced a substantial amount of additional revenue. Added residential revenue, exclusive of that represented by new customers, totaled $170,000 on an annual basis, while new commercial revenue was $240,000 and industrial was $410,000.

During 1938 the company continued its extension of rural lines, adding 1,068 miles of new pole lines. Service was supplied to 6,356 new rural and urban customers. The rural work has become so extensive, Mr. Mitchell said, that the company has created a rural service promotion department to increase use of electricity by customers.

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## Parker Dam Contract Approved by Group

Interior Department approval, expected in the near future, will complete arrangements for delivering Parker Dam power through facilities of the Salt River Valley Water Users Association and the Arizona Light & Power Co. Association approval of the contract last week followed power company approval several days earlier.

Under the arrangement, power from a 60,000-kva. installation to be made by the government at Parker will be delivered over a 154-kv. government transmission line to Phoenix, Ariz. There the two distributors will purchase the energy at 1.9 mills per kilowatt-hour, with $200,000 guaranteed as the annual minimum by each.

Energy delivery is scheduled by July 1, 1941. Meanwhile a transmission line from Boulder via Parker is scheduled for completion by September of this year to relieve a possible Arizona shortage in the interim with energy from Metropolitan Water District generators at Boulder Dam. Survey of the line is under way and construction awaits a $1,300,000 congressional appropriation covering part of the costs.

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## Labor Board Order

The NLRB has ordered Ohio Power Co., Newark, Ohio, to disestablish the company-dominated Topco Employees' Association and to stop interference with self-organization of its employees.

## Wakelee Named Head of New Jersey Utility

### *Succeeds McCarter, who becomes board chairman — Young is head of executive committee*

Edmund W. Wakelee, vice-president of Public Service Corp. of New Jersey in charge of law since 1923, this week was elected president to succeed Thomas N. McCarter, who was named board chairman, a new position which Mr. McCarter had suggested a few weeks ago. At the same time Percy S. Young, vice-president in charge of finance, was named chairman of the executive committee, also a new post.

#### *Average 3 Cents per Kw.-Hr.*

At the annual meeting of stockholders, last Monday, Mr. McCarter stated that the "residential and water heating business was done at something like 5.09 cents per kilowatt-hour for the year ended March 31, 1939." He said that "now all our electricity taken together is sold at an average price of approximately 3 cents per kilowatt-hour."

Mr. McCarter told stockholders that he had requested, after 36 years of service as president, that he not be re-elected to the presidency as he desired to "lighten up a little," since he was 71½ years old.

#### *Growth in Revenue*

He traced the development of the company from a gross of $17,000,000 in 1903 to $127,000,000 in 1938, with gross of $131,000,000 estimated in 1939. Of the 363 meetings of the board of directors, Mr. McCarter said, he has attended and presided at 352 of them since the company was founded.

Discussing the international situation, Mr. McCarter said that this country should not engage in any war except a war of defense when this country is attacked.

Mr. McCarter indicated that earnings of the corporation for 1939 would be about $2.60 a share and common dividends have tentatively been put on a basis of $2.40 a share.

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## Vermont Kills All Bills on Municipal Ownership

In the closing hours of the Vermont Legislature, which adjourned on Friday of last week, the general enabling act which would have permitted any city or town to embark upon municipal ownership after a mere majority vote was killed in the Senate by a three to one margin. Local bills for public ownership in Barre, Vergennes and Shelburne also failed to pass, as previously announced in ELECTRICAL WORLD. A belated attempt to force reconsideration of the Shelburne measure died in infancy.

Less gratifying was the passage of a joint resolution to set up a special commission to investigate water resources and electrical energy production and distribution in the state. This implies a so-called "Little TVA" survey, but a provision in the resolve specifies that the investment in private utilities should be adequately protected, and the report of the five commissioners to be named by the Governor is not due until 1941. The private utilities were also burdened with tax legislation which assesses 0.1 per cent of gross for adding engineers and accountants to the staff of the Public Utilities Commission, and a law also passed taxing flowage rights on severance of property.

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## Hetch Hetchy Power Vote Set for May 19

San Francisco voters will be called upon May 19 to decide for the eighth time whether the city shall embark upon the business of electrical distribution. On the ballot will be a charter amendment which would authorize issuance of revenue bonds, allow the Public Utilities Commission to build or to buy, and embody Plan 8, which the commission need or need not follow. It requires a majority vote.

A year ago, in March, a similar proposal was defeated by 12,000 votes. San Francisco is served by Pacific Gas & Electric Co., and under a company-city agreement P.G. & E. acts as a distributing agency for power generated in the city's Hetch Hetchy plant. This agreement has been held illegal in federal court. The injunction has been stayed.

Before the May election, the stay will expire, but many feel that the forthcoming election, plus prospect of an appeal in U. S. District Court, will lead to a further stay.

Plan 8 proposes a $55,000,000 issue of revenue bonds, interest not to exceed 6 per cent. Out of this it is proposed to establish a city-wide distribution system, build a hydro plant at Red Mountain Bar (20,000 kw. with about 15,000 kw. firm), provide working capital, shops, etc. Transmission facilities would be leased and half or more of the energy purchased.

The issue is $5,000,000 more than was proposed a year ago and is based on actual book costs of the P.G. & E. San Francisco electrical distributing facilities in 1937, plus betterments through 1938.

# Young Utility Men Hold Conference In Indiana

***Second annual conference draws more than 300 representatives of utility companies in state — Lieut.-Gov. Schricker speaks on relation of the citizen to his government***

More than 300 young men representing the utility companies of Indiana attended the second annual Young Men's Utility Conference of the Indiana Electric Association, held on Friday of last week in Indianapolis at Ipalco Hall of the Indianapolis Power & Light Company.

Participation in the conference is limited to utility men under 35 years of age. Purpose of the conference is to permit younger utility men to familiarize themselves with the problems of the industry as presented by state and national authorities and to promote the free interchange of ideas between men of the various companies.

Lieut. Gov. Henry F. Schricker spoke at the luncheon meeting of the conference on the subject of the "Relation of the Citizen to His Government."

The morning session of the conference was presided over by C. B. Calvert, president Indiana Electric Association. Speakers at this session included M. J. Briggs, manager Indiana State-Wide REMC, who discussed REMC progress; S. A. Anderson, Purdue University, who described Purdue's rural extension program and its relationship to rural electrification; Dean M. O. Ross, Butler University, who summarized current economic trends.

Dean Ross suggested four steps that might be taken to correct current economic ills: (1) Rehabilitation of the capital goods industry through revision of wages and hours; (2) encouragement of capital; (3) adoption of a pricing policy allowing free fluctuation of prices in line with changing production costs; (4) a general strengthening of the national moral fibre.

C. W. Leihy, editor of *Electric Light and Power*, spoke on "Selling Yourself Into a Job," and W. Rowland Allen, personnel director of L. S. Ayres & Co., discussed the personnel problems of modern industry today.

Speakers at the afternoon session, with R. A. Gallagher, president of Public Service Co. of Indiana presiding, included C. W. Caldwell, Purdue University; C. C. Knipmeyer, Rose Polytechnic Institute; J. E. Walters, personnel director Purdue University, and John G. Longsdorf, advertising director Indianapolis Power & Light.

The papers presented were summarized by F. B. Culley, vice-president Southern Indiana Gas & Electric Co., and Dan C. Hess, general superintendent Indianapolis Power & Light.

The committee on arrangements included Wallace O. Lee, vice-president in charge of personnel and public relations, Indianapolis Power & Light Co., and Tom C. Polk, Public Service Co. of Indiana and secretary of the Indiana Electric Association.

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## Rural Line Extension

Shawinigan Water & Power Co. reports that its rural distribution system has been extended during the past four years by construction of 1,200 miles of new lines.

**UTILITY MEETING—More than 300 representatives attended the conference in Indianapolis. L. to r.—Wallace O. Lee, vice-president Indianapolis Power & Light; Lieut.-Gov. Henry F. Schricker of Indiana; C. B. Calvert, president of Indiana Electric Association; Tom C. Polk, Indianapolis Power & Light. Below—View of the dinner during the meeting. Lower right—Dan C. Hess, general superintendent, and (right) the late E. G. Ralston, vice-president of Indianapolis Power & Light**

## E.E.I. Engineering Groups to Hold Meet

Edison Electric Institute has announced the program for the engineering committee meetings which will be held at the Edgewater Beach Hotel, Chicago, May 1-4.

At the opening session of the electrical equipment committee meeting H. W. Eales will discuss the San Diego switch-house fire. H. S. Fitch will report on insulating oils and R. W. Wilbraham will present the point committee O.C.B. reports. A joint session with the accident prevention committee will be held in the afternoon at which there will be a symposium on the design of substations from the point of view of accident prevention.

S. M. Dean will talk on the "Basis of Investment for Increased System Reliability" before the system engineering division and R. A. Hentz will present "Progress Reports on Preferred Voltages" before the utilization division. A. B. Craig will give a summary of public utility commission rules before the meters and services division.

At the sessions of the apparatus and design division subjects to be discussed include: Rotating synchronous machines, station design and generator insulation and testing.

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## U. S. Chamber Will Discuss Utilities

The annual meeting of the Chamber of Commerce of the United States will be held in Washington, D. C., May 1-4.

"The Electric Utilities' Opportunity" is the subject of an address that will be made by L. R. King, president of the Iowa-Nebraska Light & Power Co., Lincoln, Neb. Mr. King's address will be one of the three talks under the general subject of "The Future for Power and Fuel." The two addresses on fuel will be by Frank Phillips of the Phillips Petroleum Co., Bartlesville, Okla., on the petroleum industry, and by James D. Francis, president of Island Creek Coal Co., Huntington, W. Va., on the coal industry.

J. F. Owens, president of the Oklahoma Gas & Electric Co., chairman of the chamber's natural resources department committee, will preside. Following the addresses there will be general discussion of fuel and power problems.

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## Launch Kitchen Drive

The Electric Association of Kansas City, Mo., has plans to launch a certified electric kitchen activity, with a specification and certificate for both a "standard" and "de luxe" electric kitchen. This will be an adjunct to the "Red Seal Plan" for adequate home wiring.

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## AAE Has New Chapter

A charter for a new chapter has been granted by the national board of directors of the American Association of Engineers to the engineers of Rock Island, Moline, Ill., and Davenport, Iowa. The new chapter is to be called Tri-City Chapter, American Association of Engineers. T. F. Murray, engineer United Light & Power Service, Davenport, Iowa, is president of the chapter.

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## Court Restrains NLRB Vote

Regional National Labor Relations Board office in Detroit has announced that an injunction restraining it from conducting a vote among 2,700 employees of Consumers Power Co. has been granted by the Federal Circuit Court of Appeals in Cincinnati. The vote would have given sole bargaining rights either to the utility workers' organizing committee, a Congress of Industrial Organization affiliate, or the International Brotherhood of Electrical Workers, an A.F. of L. union. A previous vote failed to establish the required majority.

## MEETINGS

**Electrochemical Society**—Spring convention, Columbus, Ohio, April 26-29. Dr. Colin G. Fink, secretary, Columbia University, N. Y.

**Edison Electric Institute**—Engineering committees meetings, Edgewater Beach Hotel, Chicago, Ill., May 1-4. Bernard F. Weadock, managing director, 420 Lexington Ave., New York, N. Y.

**National Fire Protection Association**—Annual meeting, Stevens Hotel, Chicago, Ill., May 8-12. A. R. Small, chairman electrical committee, 207 East Ohio St., Chicago, Ill.

**Refrigerating Machinery Association**—Annual meeting, The Homestead, Hot Springs, Va., May 11. Association Headquarters, Southern Bldg., Washington, D. C.

**Air Conditioning Manufacturers' Association**—Annual meeting, The Homestead, Hot Springs, Va., May 13. William B. Henderson, executive vice-president, Southern Bldg., Washington, D. C.

**National Electrical Manufacturers Association**—Spring conference. The Homestead, Hot Springs, Va., May 14-19. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

**National Electrical Wholesalers Association**—Annual convention, The Homestead, Hot Springs, Va., May 22-25. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

**National Association of Purchasing Agents**—Annual convention, Fairmont Hotel, San Francisco, May 22-25. G. A. Renard, executive secretary-treasurer, 11 Park Place, N. Y.

**Northwest Electric Light and Power Association**—Accounting and business practice section, Vancouver, B. C., May 26-27. Berkley Snow, secretary, 707 Spalding Bldg., Portland, Ore.

## Condenser Bushings Are Longer-Lived

Paper-wound condenser bushings for transformers, circuit breakers and other apparatus have been improved to such an extent that they now have a longer life, according to A. J. A. Peterson, Westinghouse switchgear engineer, who described the improvements before the American Institute of Electrical Engineers Southwest district meeting at Houston, Tex., this week.

Protection against external deteriorating influences is obtained by improved methods of winding the condensers, by impregnation with a polymerizing oil and by the application of surface varnish with improved sealing and electrical characteristics. Outdoor bushings are further protected, Mr. Jones said, by sealing in weather casings with either oil or a new plastic material serving as the space filler. Fexible caps furnish spring follow-up on gaskets under all conditions.

A new 115-kv. oil-incased bushing with a weather casing containing 10 quarts of oil and 2 quarts of water was operated continuously with 132 kv. —twice normal voltage to grounded flange. At the end of 60 days there was no measurable change in the power factor of the bushing, Mr. Jones commented.

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## Memphis Board Organized

Organization of the Memphis (Tenn.) Light, Gas and Water Comission was recently completed with election of officers. W. W. Mallory, member of the old light and water board, was elected president at a salary of $12,000 per annum. Major Thomas H. Allen was elected vice-president and chief engineer at a salary of $10,000 a year. Ira J. Lichterman was named commissioner and N. M. Wade, secretary of the old board, was made secretary of the new board.

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## Georgia Utilities Cited

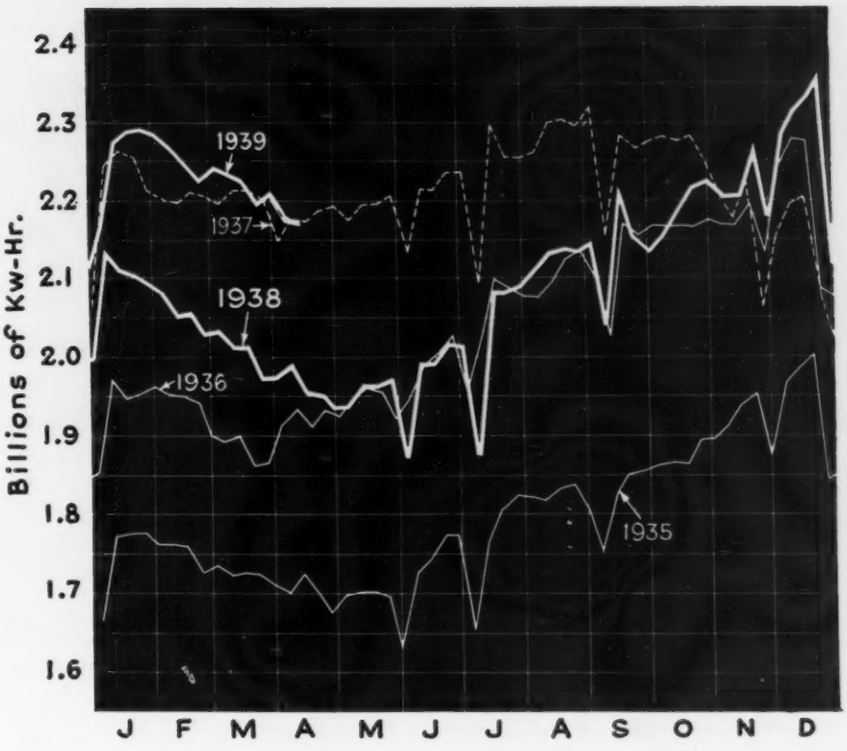
George Public Service Commission has issued rules *nisi* requiring two South Georgia power companies to show cause why their electric service rates should not be reduced. Savannah Electric & Power Co. was cited to show cause on April 24 why its residential rates should not be reduced in conformity with an automatic reduction in commercial rates that will become effective on June 1. Georgia Power & Light Co. was cited to show cause on May 24 why its commercial and residential rates should not both be reduced.

## Output Sags Slightly — 10.9% Over 1938

Output of energy by the electric light and power industry during the week ended April 15 continued virtually at the level of the preceding week, the decline to 2,170,671,000 kw.-hr. amounting to only 0.1 per cent, according to statistics reported by the Edison Electric Institute. The production was less by an equally small fraction than in the corresponding week of 1937.

Compared with 1938 the gain increased to 10.9 per cent, following the shrinkage of the preceding week to 9.2 per cent. Although it is no longer setting new records for the season, as was the case earlier in the year, the curve is still hovering close to the 1937 level.

In view of the yearly increase in domestic consumption industrial sales are probably somewhat under those of 1937, while far above 1938. Regional gains expanded to 14 per cent or more in New England, the Central Industrial area and the Rocky Mountain states, the last named showing a strong upward trend.




**Weekly Output, Millions Kw.-Hr.**

| 1939 | 1938 | 1937 |
|---|---|---|
| Apr. 15...2,171 | Apr. 16...1,958 | Apr. 17...2,173 |
| Apr. 8...2,174 | Apr. 9...1,990 | Apr. 10...2,176 |
| Apr. 1...2,210 | Apr. 2...1,979 | Apr. 3...2,147 |
| Mar. 25...2,199 | Mar. 26...1,975 | Mar. 27...2,200 |
| Mar. 18...2,225 | Mar. 19...2,018 | Mar. 20...2,211 |
| Mar. 11...2,238 | Mar. 12...2,015 | Mar. 13...2,213 |

**Per Cent Change from Previous Year**

| | Week Ending | | |
|---|---|---|---|
| | Apr. 15 | Apr. 8 | Apr. 1 |
| New England | +14.5 | +12.4 | +14.3 |
| Middle Atlantic | + 8.6 | + 7.9 | + 9.8 |
| Central Industrial | +14.0 | +11.3 | +15.3 |
| West Central | + 2.2 | + 1.2 | + 1.9 |
| Southern States | + 5.9 | + 7.4 | + 8.8 |
| Rocky Mountain | +14.2 | +12.8 | + 9.0 |
| Pacific | +11.4 | + 8.1 | + 9.9 |
| United States | +10.9 | + 9.2 | +11.7 |

## Stoll Named Head of Maryland Group

Many men well known in the electrical field attended the annual meeting of the Maryland Utilities Association, which was held at the Lord Baltimore Hotel, Baltimore, last week. Harold Haydon, Potomac Electric Power Co., was elected vice-president. He was chairman of the meeting held by the electric group.

Speakers at the electric group meeting included Lorenzo Semple, Jr., assistant vice-president American Water Works & Electric Co., whose subject was "Improved Service at Lower Cost—Through Better Tools to Work With"; W. J. McLachlan, central station engineer General Electric Co., who spoke on "This Business of Distribution Engineering," and George Whitwell, vice-president Philadelphia Electric Co., who discussed "The Social Responsibility and Opportunities of Electric Utilities."

At the general session the speakers included T. Justin Moore, Virginia Electric & Power; Dr. William McClellan, president Potomac Electric Power, who spoke on "The Larger Problems Facing Utilities."

Joseph A. Stoll, Baltimore Transit Co., was elected president of the association. R. F. Bonsall of the Consolidated Gas, Electric Light & Power Co., was re-elected treasurer, and J. H. Purdy, also of the Consolidated, was elected secretary.

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## Swope Analyzes Position of Industry in Society

Speaking of mechanization at the Union College (Schenectady) conference on industry and government, Gerard Swope, president of the General Electric Co., said that "though hardships may be imposed for a time, such increased effectiveness in lowering costs rebounds to the advantage of society and eventually increases employment." He suggested cushioning of the hardships caused by technological and cyclical unemployment, but emphasized that "what is really needed here is an incentive to employers to stabilize employment or assure a minimum annual wage."

W. R. Burrows, G. E. vice-president, offered three fundamental rules: "(1) Pay at least as high as average 'community rate' for each classification of labor; (2) considerate treatment of labor unions in their formative period, and (3) prompt handling of grievances by supervisory force."

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## Rejects Board Appointee

Appointment by Gov. Arthur H. James of John Siggins, Jr., of Erie as a member of the Pennsylvania Public Utility Commission has been voted down in the Senate by a vote of 27 to 17, seven votes less than the constitutional majority necessary for confirmation. The Siggins appointment was sent back to the committee on executive nominations.

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## Electric Output in Canada

Output of central electric stations in Canada in February totaled 2,213,938,000 kw.-hr., compared with 2,386,771,000 in January and 2,057,598,000 kw.-hr. in February, 1938, an increase of 7.6 per cent, according to the Dominion Bureau of Statistics. Exports to the United States were 153,491,000 kw.-hr., compared with 166,915,000 in January and 123,094,000 in February a year ago.

## Utility Securities Make Up Part of Losses

50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 100 90 80
1931 1932 1933 1934 1935 1936 1937 1938 Jan. Feb. Mar. Apr. May June 1939

**Electric utility securities closed lower this Tuesday, but for the week the "Electrical World" stock index was up 0.6 point to 28.4, following a drop of 1.4 points in the previous week. The bond index moved up slightly, rising 0.2 point to 103.7**

## Delayed Utility Issue Placed on Market

Subject to exchange rights of present preferred-stock holders, public offering was made this week of 223,063 shares of 4½ per cent cumulative $100 par series B preferred stock of the Consolidated Gas, Electric Light & Power Co. of Baltimore, at $112.50 and accrued dividends. The offering was delayed last week because of unsettled conditions abroad.

Shares being offered by the underwriters are those shares not required or reserved for issue to holders of the existing series A 5 per cent preferred stock of the company and the offering is subject to the allotment and to the existing preferred-stock holders' prior right of exchange. The new preferred issue is being first offered in exchange, share for share, to the holders of existing series A 5 per cent preferred stock.

Net proceeds of the sale of shares not so exchanged will be applied to the retirement of the unexchanged shares of series A preferred stock, and the remainder, if any, will be used to reimburse the company's treasury for capital expenditures made since April 30, 1934.

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## Court Vacates SEC Order

The United States Circuit Court of Appeals in Boston has vacated an order of the SEC exempting the International Paper & Power Co. from regulations affecting holding companies, and ordered the case returned to the commission for a rehearing. The petition was brought by John Lawless, Jr., stockholder. The order of the commission, which Mr. Lawless opposed, permitted the power company, at that time unregistered as a holding company, to distribute and make public offering for the sale of its securities by the use of the mails, "in violation of the express provision of the public utility holding company act," said the court, in an opinion written by Judge George H. Bingham.

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## Revenue Exemption Raised

SEC has announced an amendment to its holding company exemption rules so that hereafter holding companies with combined gross revenues up to $350,000, instead of $150,000, are exempted from all provisions of the Holding Company Act. The amended rule also provides that if the total value of the properties employed in all the gas and electric operations of a system did not exceed $1,000,000 at the close of the preceding year it is granted full exemption from the act.

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## Vote Dissolution of Unit

Dissolution of Electric Power Associates, Inc., was voted at a special meeting of stockholders. The order will be carried out by distribution of securities held where practicable or by cash payments from sale of securities over an extended period of time.

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## Seeks Reorganization

A petition has been filed in federal court for reorganization of the Portland Electric Power Co. The bonds are in default of principal and interest to over 30 per cent of their face value. Lack of earnings from traction facilities since 1930 was given as the cause of the bond default. A plan of reorganization has been under consideration by the SEC.

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## SEC Gives Findings on Northern States

SEC has no rule requiring an issuer of securities to seek underwriters through competitive bidding, the commission stated in issuing its recent findings in the case of Northern States Power Co. of Wisconsin. At the same time the commission declared that its "arm-length" bargaining rule affects only those transactions in which the underwriter stands in one of the following relationships to the proposed issuer: (1) Is in the same holding company system; (2) is an affiliate; (3) bears such a relationship that there is "liable to be, or to have been, an absence of arms-length bargaining with respect to the transaction." If the underwriter falls within one of those classes, and receives more than a 5 per cent participation in the underwriting, the commission held he was prohibited from receiving a fee unless it could be shown that a diligent effort had been made to receive competing bids.

In its findings in Northern States case SEC announced that the records of the transaction did not disclose that any underwriter falling within one of the categories described had received a participation in excess of 5 per cent. Hence none of the underwriters was under any disability to receive an appropriate fee despite the absence of competitive bidding.

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## Stock Auction Postponed

Auction of 712,411 shares of Jersey Central Power & Light Co. common, collateral for National Public Service Corp. debentures, has been adjourned to May 3.

## Utility Reports

| | Net Income 1939 | 1938 |
|---|---|---|
| †California-Oregon Pwr. | $894,189 | $927,079 |
| †Duquesne Light | 9,181,058 | 9,955,632 |
| †El Paso Elec. (Del.) | 276,569 | 211,792 |
| *Engineers Pub. Serv. and subs. | 4,567,245 | 3,852,904 |
| *Florida Pwr. & Lt. | 1,824,956 | 1,439,099 |
| †Gulf States Util. | 2,133,255 | 1,914,241 |
| †Louisville G. & E. (Ky.) and subs. | 2,590,865 | 2,645,165 |
| *Pennsylvania Pwr. & Lt. | 7,918,652 | 8,062,143 |
| †Puget Sound Pwr. & Lt. and subs. | 1,551,754 | 1,746,363 |
| †San Diego Cons. G. & E. | 1,468,679 | 1,329,111 |
| †United Gas Corp. and subs. | 5,426,438 | 10,796,436 |
| †Virginia Elec. & Pwr. | 3,531,037 | 3,371,613 |

*Twelve months ended February 28.
†Twelve months ended January 31.

# OPERATING PRACTICES

## Lighting Dip Due to Heavy Motors

By E. M. ADKINS
Jersey Central Power & Light Company, Asbury Park, N. J.

Lighting voltage dips caused by starting of large motors connected to primary circuits may be more severe and troublesome than similar dips caused by starting small motors on secondary circuits* due to the greater area affected. The accompanying chart may be used to determine primary voltage drop caused by motor starting, in terms of a 120-volt lighting circuit.

The chart is read as shown by the direction of the arrows, starting with the distance from source (substation bus) to motor, on the abscissa, to an intersection with the proper motor hp. line, thence to an intersection with the proper conductor curve, from which point the voltage dip is read on the top abscissa scale.

Dip in lighting voltage due to starting a motor not on the chart may be found by locating the actual locked rotor current on the proper scale and drawing a line through it from the origin. Dip in lighting voltage is then found by starting on the distance scale and reading to an intersection with this new curve, thence to an intersection as before with the curve for conductor size, and from there to the voltage drop scale.

Motor data used (see table) in construction of the chart are for standard general-purpose squirrel-cage induction motors.

For the condition of dips in lighting voltage occurring with a considerable interval between, which is most common, a total dip of 6 to 7 volts can generally be allowed.

* See also charts on page 70, ELECTRICAL WORLD of March 25, 1939.

**Data for Large Three-Phase Motors**

| Motor Size | Locked Rotor Current at 220 V. | Starting Power Factor |
|---|---|---|
| 25 hp. | 450 amp. | 35% |
| 30 | 510 | 35 |
| 40 | 680 | 35 |
| 50 | 800 | 35 |
| 60 | 1075 | 35 |
| 75 | 1300 | 35 |
| 100 | 1600 | 35 |
| 125 | 2200 | 35 |
| 150 | 2400 | 35 |
| 200 | 3500 | 35 |

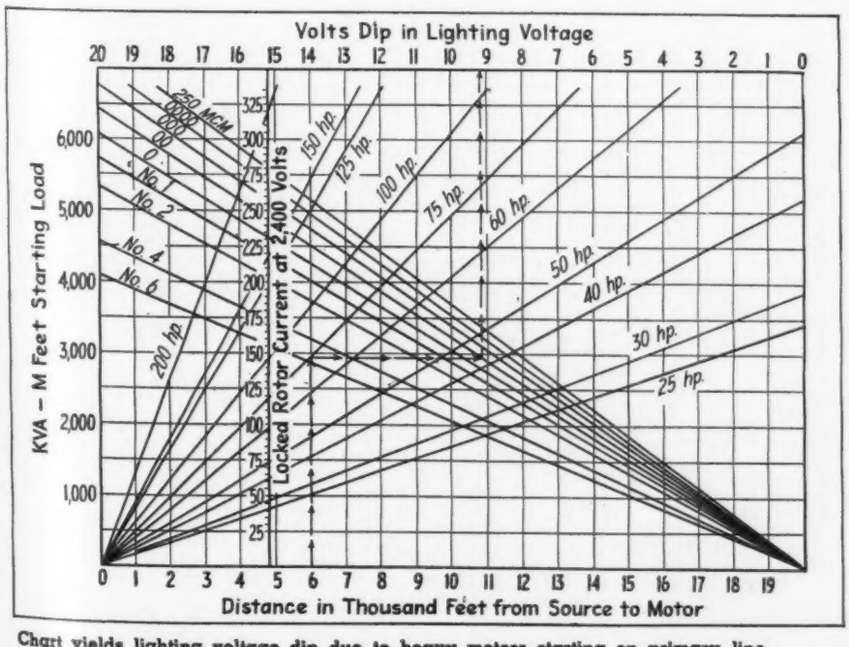


**Chart yields lighting voltage dip due to heavy motors starting on primary line**
Chart constructed for 2,400 volts. For 4,160 volts divide drop found by 3, for 4,800 volts divide by 4

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## Entire Kenotron Set Is Movable

Lynn Gas & Electric Company is developing Kenotron testing of cables as a part of its maintenance routine, and its present equipment consists of a "KC-4" tube housed in a screened-in container, an instrument panel attached to the latter, 42-kv. step-up transformer, sphere gap and a movable control desk located in a test room in the main service building which can also be used for demonstrations and lectures to employee groups.

This equipment is mounted on casters to facilitate its use, and a number of safety features are provided. The test room doors are interlocked with the supply of 60-cycle test input energy, so that if either door opens an inch or so, the test goes dead. Unless the operator's foot pedal at the test desk is depressed, high-voltage supply is off. Pilot lamps on the desk indicate when the power circuit is energized, when the circuit breaker in the supply line is closed and the status of voltage rise at the test regulator. The tube is carried in a frame made of ¾-in. pipe, all instrument cases are grounded, and the transfer switch controlling

**Kenotron for cable testing**

the selection of scales for the milliammeter is bypassed by a safety gap to protect the instrument in case of an open circuit.

This set can be quickly transferred to other parts of the plant by elevator and ordinarily requires two men for its operation. As a maintenance test device its value is increasing, and the company is considering the adoption of a 70-kv. test voltage in certain future work.

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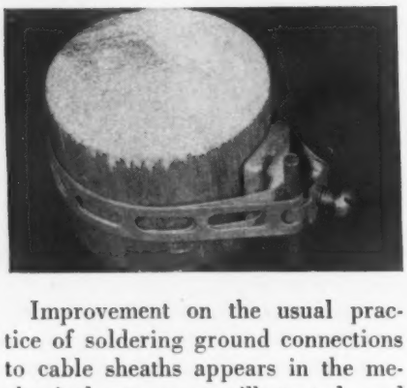
## Mechanical Connector for Cable Sheath



Improvement on the usual practice of soldering ground connections to cable sheaths appears in the mechanical connector illustrated and which was developed in the engineering department of the Indiana & Michigan Electric Company, South Bend, Ind. The device consists of a tinned copper strap, with slots for adjustment to various cable diameters, that by means of a screw and block is tightened around the cable sheath and at the same time grips the ground conductor firmly. The new connector does not heat because of its large contact area, is easily installed and is readily findable when covered with fireproofing.

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## Splicing Trailer Proves Up

By THEODORE E. STARRS
Underground and Transmission Construction, Public Service Electric & Gas Company

Installation of an oil-filled cable system involves a technique quite different from that required in the installation of solid-type cable. In the operations of both handling the cable and splicing the joints numerous special items of field equipment are necessary. Among these, and related to the splicing itself, is an item generally designated as a splicing trailer.

The splicing trailer fulfills three essential functions: (1) It permits splicing operations to proceed continuously and renders them independent of weather conditions; (2) it markedly reduces the exposure of the splicing materials, and the operation of splicing itself, to contamination by moisture and dirt; (3) it serves as a portable toolroom in housing and transporting the numerous tools and equipment associated with splicing.

The trailer shown in the accompanying illustration is the type used by the Public Service Electric & Gas Company of New Jersey during the installation in 1937 of the 132-kv. oil-filled cable system between Essex and Bayway switching station. Intended primarily only as a preliminary design for temporary use during the oil-filled installation, it has since then been found to possess sufficient utility in the splicing of 13-kv. and 26-kv. solid-type cable to justify its retention for this purpose.

The chassis consists of a 5-in. channel frame—the sections of which are welded together with 4-in. angle as illustrated—mounted on two front Ford wheel-and-axle assemblies with pneumatic tires. A wooden liner, bolted to the frame, carries the body. Two manhole openings are provided so that, in those instances where local obstructions prevent the trailer from being centrally located over a manhole, the end opening may be used. Open-flame operations, such as heating solder and flushing oil, are carried on at the front of the trailer, where, for protection against fire, the front wall, platforms and floor have been covered with sheet asbestos. The wall and roof material is ¼-in. wallboard. Ventilation is provided by nine ventilators and four large windows. The trailer is wired for three ceiling lights, three wall outlets and four external corner lights, with an external weatherproof socket under the floor for connection to the power source.

When used on oil-filled cable it is equipped with a water pump, two generators, air blower, two manhole rings, two ladders, three tarpaulins

**Splicing trailer on the job**

with frame, three furnaces and pots, three long planks, two splicers' stools, gasoline and kerosene, six tanks of acetylene gas, fire extinguisher, first-aid kit, oil and refuse containers, guard stands, lanterns and about 100 splicing and other tools.

Three trailers were built for the installation. At any time only two were actively engaged in splicing; the third was kept always in advance

# How You Can Realize

# *Actual Economy*

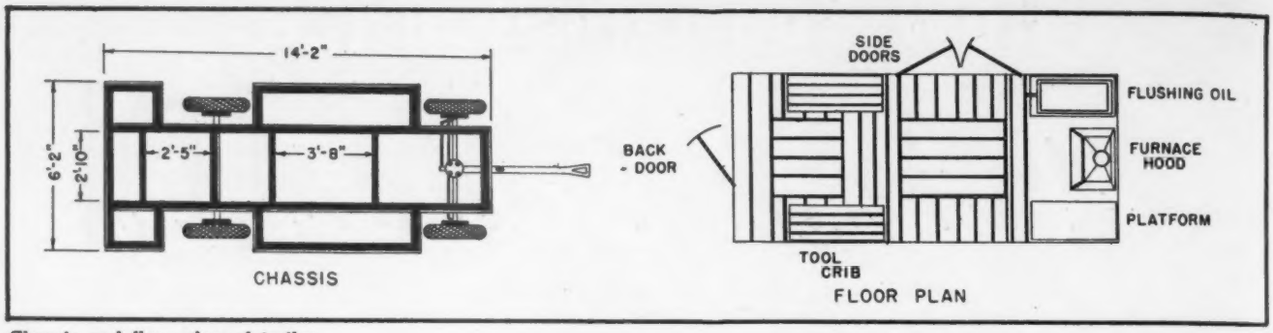
## in Station Design and Construction

HERE'S how to realize this economy: You actually save in time and cost f installation because the **FH** cubicle is a ompletely factory-assembled equipment. is compact, unified, and made up of the reaker, disconnecting switches, mechanical terlocks, instrument transformers, buses, nd connections—all assembled, shipped as unit, and ready for installation. In addi- on, you realize the benefits of safety to perator and protection of equipment. So, ssist on the best—**FH** cubicles.

**A new booklet** with many pictures and few words, dealing with FH cubicles and FH metal cells. It sets forth the important advantages of factory-assembled switchgear, which affords the best method of installing FH breakers if you want to obtain over-all station economy. Ask for Bulletin GEA-3143.

**GENERAL ELECTRIC**

880-35




**Chassis and floor plan of trailer**

of the splicing crew at the next scheduled splicing location. About 45 minutes before the splicing operations at either active trailer were completed a special crew prepared the inactive trailer for splicing; it also loaded the evacuated trailer and moved it to the next scheduled manhole.

The Public Service experience with these trailers indicates that, in future designs, there are distinct advantages to be gained by increasing all trailer dimensions, provided the terrain over which the trailer will be used will permit it. With the amount of equipment that must be moved, the trailer illustrated in the drawing is rather crowded and some of the equipment has suffered from handling.

•

## Drive Ground Rod by Water Method

After having used ground rod drivers for some time and with considerable success, Central Illinois Electric & Gas Company has abandoned them for a method which is giving remarkable results in the gravel and clay soil in the Rockford territory.

The new method is simplicity itself. All that is required is that a shallow basin be dug in the ground where the rod is to be driven and filled with water (and salt if desired). The ground rod is then held vertically and worked into the ground with a motion much like that employed in using a digging bar. The hole into which the rod is being worked is kept filled with water during the driving. It is reported that 12-ft. rods can be driven by hand and with ease in this manner in anywhere from three to five minutes. When the rod is worked down sufficiently by hand the balance of the driving is done with a sledge or other drive.

This method is not proof against large stones, however. Where they are encountered driving must be tried in a new spot a few feet away.

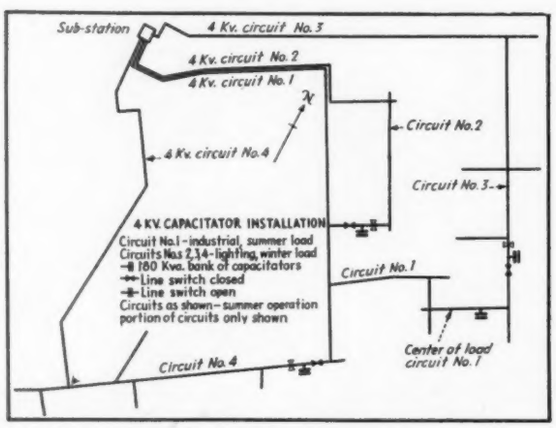
•

## Work Capacitors at Maximum Load Factor

By HENRY H. BUELL
Electrical Superintendent
Pacific Gas & Electric Company,
San Jose Division

Careful location and installation of four 180-kva. banks of shunt capacitors on a section of the system of the Pacific Gas & Electric Company has made it possible to transfer any one of three of the banks from one circuit to another with seasonal changes in circuit loading. By a little simple switching the greatest possible use is made of the capacitors throughout the year.

The capacitors were originally considered for a 4-kv., 2-mile, No. 4/0 circuit serving an area having a high summer load factor, particularly during the fruit season, arising from a concentration of canning operations. Power factor of the circuit was abnormally low during peak season, being about 56 per cent. During the balance of the year load on this circuit is low, since the connected residential lighting load is very small.


Sub-station
4 Kv. circuit No. 3
4 Kv. circuit No. 2
4 Kv. circuit No. 1
4 Kv. circuit No. 4
Circuit No. 2
Circuit No. 3
Circuit No. 1
Circuit No. 4
Center of load circuit No. 1
4 KV. CAPACITATOR INSTALLATION
Circuit No. 1 - industrial, summer load
Circuits Nos 2, 3, 4 - lighting, winter load
180 Kva. bank of capacitators
Line switch closed
Line switch open
Circuits as shown - summer operation
portion of circuits only shown

**Switch capacitors from circuit to circuit with changes in seasonal load conditions**

On the other hand, the adjacent 4-kv. circuits in this same general area supply lighting load almost entirely and have their peak during winter months, at the same time as the system winter peak. These adjacent circuits are also loaded almost to capacity during their peak period, and relief will be indicated in the near future.

In view of these facts it appeared desirable under the conditions to consider ways and means of utilizing the capacitors 100 per cent of the time, thus realizing full benefit of the investment. Accordingly, the capacitors were so located and installed that by merely operating two switches, one of which would normally be provided as a tie switch between two circuits, any one of three of the banks could be transferred from one circuit to another and back again, at the proper time of year. The method of doing this is shown on the diagram.

Results secured have been entirely satisfactory, although, as was to be expected, power factor on the lighting circuits was considerably higher than that on the industrial circuit. Hence, much less capacity was required to secure the most practical results. The one bank of 180 kva. of capacitors, transferred to each of three lighting circuits, provides about the maximum desirable correction.

It is realized that the scheme employed meets a special case and that switching the capacitors from one circuit to another involves an operating detail which might not be carried out. However, there may be possibilities in this plan worthy of consideration.

# $50,000 Substation Investment Postponed

## HOW AN OHIO UTILITY PROFITED FROM THE USE OF PYRANOL CAPACITORS TO IMPROVE POWER-FACTOR

### Capacity was needed

In 1937, growing load on the substation and feeders serving the downtown area of Warren, Ohio, made it necessary for the Ohio Public Service Company to provide additional capacity. A study showed that the location and layout of the existing substation would not permit the addition of new capacity at the station. To expand facilities would have required the building of a new substation on the other side of town—the only place where a suitable site was obtainable.

### Capacitors were applied

Further analysis showed that this investment could be forestalled, and profitable handling of the load growth assured for one year, by an installation of shunt capacitors on the feeders. Such an installation, by improving power-factor, would release capacity that was loaded with reactive kva.

Subsequently, a total of 360 kva of G-E Pyranol capacitors was installed, resulting in the release of 206 kva of existing substation capacity. The installed cost of the capacitors was $3325.

### The resulting profit

Since the saving in carrying charges on the forestalled substation investment was $6500 in the first year, the capacitors fully paid for themselves in about seven months.

This was entirely aside from savings on other items, such as the generating and feeder capacity released for new load, and the increased revenue which resulted.

### Investigate for yourself

Opportunities exist on most systems today for the profitable application of G-E Pyranol capacitors. If there are overloaded substations or feeders on your system, it will pay you to investigate this economical, reliable means of releasing capacity. Reduced voltage drop and reduced losses are other benefits that usually follow the installation of capacitors. Ask your G-E representative for complete information, or write for Bulletin GEA-2746, *Pyranol Capacitors for Central Station Applications*. Address General Electric Company, Dept. 6—201, Schenectady, N. Y.

**HOW RELIABILITY IS BUILT INTO PYRANOL CAPACITORS**

Thorough testing of G-E Pyranol capacitors during the entire manufacturing process is a major reason for the reliability of these units in service. In the test illustrated at the right, the units are placed in a special oven, where the effectiveness of their hermetic sealing is tested by a combination of pressure and high temperature.

*The G-E ten-million-volt lightning demonstration at the New York World's Fair uses 102 Pyranol capacitors, each rated 100,000 volts*

GENERAL ELECTRIC

360-143

# INDUSTRIAL ENGINEERING

## Flexible Supply for Elevator Test

Seven voltage, phase and frequency combinations are required for testing the range of elevator power units made at the Westinghouse Electric Elevator Company plant, Jersey City, N. J. In order to make any one of these combinations available at the sixteen test positions an ingenious plug board arrangement was developed which is shown in the accompanying illustrations.

The voltages required in tests are: 440 volts, two phase, 60 cycles; 220 volts, three phase, 60, 50 and 25 cycles; 220 volts, two phase, 60 cycles; 110 volts, single phase, 60 cycles, and 230 volts d.c.

The 440-volt requirements are supplied from the 440-volt plant distribution system. A delta-connected bank of 10-kva., 440/220/110-volt transformers provides the 220-volt, three-phase, 60-cycle needs, while the 50- and 25-cycle, three-phase, 220-volt requirements are satisfied by two 25-kva. alternators powered by individual d.c. motors on the plant d.c. distribution system. A Scott-connected bank of 10-kva., 440/220-volt units supply the two-phase, 220-volt current. Necessary 230 volts d.c. comes from a synchronous m.g. set.

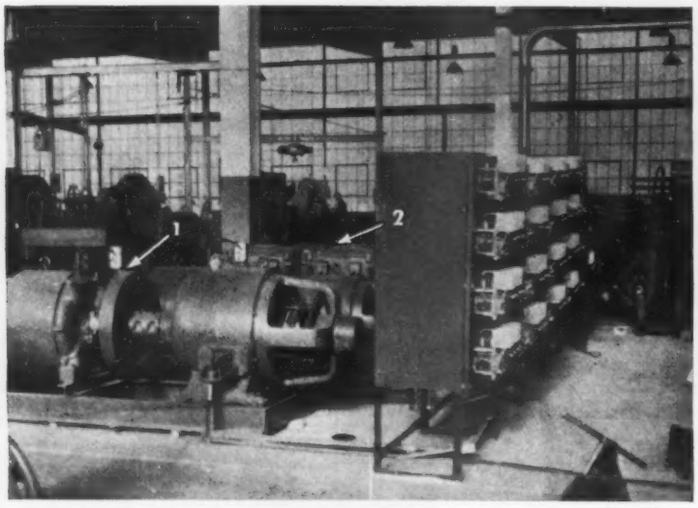
These different supplies are brought in to a main plug board and grouped according to the various classifications. Jumpers on the face of this board connect the different test stands to the particular supply voltage that is needed. Smaller individual plug boards at each test position allow the test leads to be quickly connected to the proper terminals. In addition to jacks for taking off the various voltages the plug board at each test position is equipped with push buttons for operating the machine under test. Associated controls and contactors are grouped at a central panel adjacent to the main plug board as shown in the accompanying illustrations.

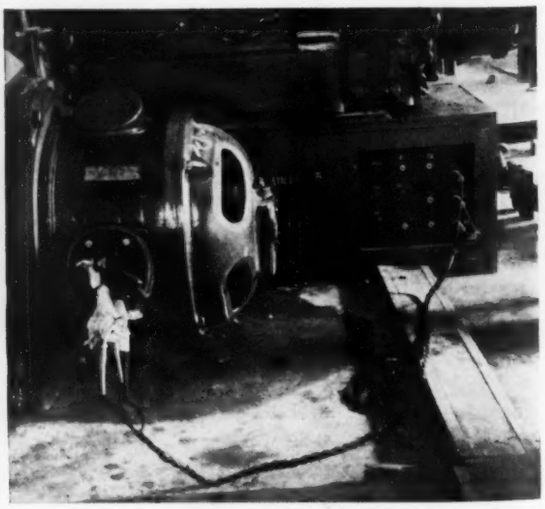
## Supercharging Boosts Compressor Capacity

When the load on air compressors at the Peoria plant of the Caterpillar Tractor Company became excessive last year, resulting in heating of drive motors, company engineers relieved the condition and boosted the capacity of the compressors 10 per cent by supercharging the units, a practice reported as new.

An 11,000-cu.ft.-per-minute, 85-hp. motor-driven centrifugal blower was installed and ducts lead off to the intake of four compressors having an aggregate rating of 7,865 cu.ft. per minute and representing a connected load of 1,400 hp. The effect of the blower was to boost the compressor intake pressure 2 lb. per sq.in., which promptly raised intercooler pressure 3 to 4 lb. per sq. in.

Supercharging is resorted to mainly during the summer months, when air is less dense due to its higher temperature and when compressor



**Two alternators and two transformer banks supply voltage combinations for test. At right, typical plug board at test stand**
In the view at the left are the 50- and 25-cycle alternators (1) and 440/220-volt, 3-2-phase Scott-connected bank and delta-connected 440-110-volt bank of transformers (2). At right in same view is contactor board with main plug board just visible in background.

# PROGRESS IN G-E WATTHOUR METERS

# *What 50 Years Have Brought*

THIS year, 1939, marks the fiftieth anniversary of the watthour meter. In 1889, the *first* watthour meter—the Type TRW—passed test and was put into service.

During all this time General Electric has made many valuable contributions to meter progress. Some were milestones — such as the Types I, I-14, I-16, I-20, and I-30. These and many other minor developments have resulted in improvements that benefit the industry.

Performance curves were flattened out and extended. Variations in power-factor, temperature, voltage, and frequency had less and less effect on accuracy. Installation became easier, energy diversion harder, and maintenance costs less. New designs kept pace with increasingly complex demands. And—prices decreased.

Even since the introduction of the Type I-30, late in 1937, detailed modifications have contributed to a continually improved product.

What has made possible this progress in the I-30? Minor changes in design and in manufacturing, new high standards of workmanship, new methods of testing and of controlling quality, and, in general, more careful attention to every detail. All these add up to the reason why today's meter is better than yesterday's; why tomorrow's will be even better. This progress will continue.

### *An Invitation*

*These improvements are interesting. So, too, is the whole process in the manufacture of a watthour meter. If you have never been through the G-E meter factory at Lynn, Mass., we think you'll find the trip profitable. You are cordially invited to make it.*

**1889**

TYPE TRW—The FIRST watthour meter. The Thomson recording wattmeter for d-c and a-c service

**1904**

TYPE I—The predecessor of the modern high-torque induction-type watthour meter

**1914**

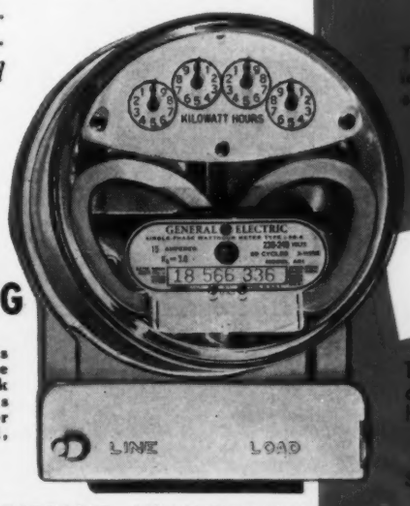
TYPE I-14—This meter made possible a marked price reduction

**1926**

TYPE I-16—The FIRST watthour meter giving long-range performance with high accuracy

**1934**

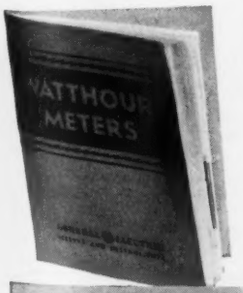
TYPE I-20—Modern mountings to meet modern installation and wiring practices




**1939**

TYPE I-30—The meter of today—the WIDE-LIMIT watthour meter. Introduced in 1937

See the G-E "House of Magic" at Both Fairs




## NEW CATALOG

**This is the 1939 edition. It contains descriptions and prices of all the latest G-E watthour meters. Ask for Catalog GEA-615. Address the nearest G-E sales office or General Electric, Dept. 6—201, Schenectady, N. Y.**

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

# GENERAL ELECTRIC

400-34

temperature and compressor load are correspondingly higher.

The initial blower, with its associated 85-hp., 440-volt, 3,500-r.p.m. induction motor, has been installed outdoors on a structural steel framework attached to the compressor house. The four compressors that it supplies are rated as follows:

| Bore & Stroke | R.p.m. | Cu. Ft./Min. | Hp. |
|---|---|---|---|
| 23 x 16 | 225 | 1,731 | 300 |
| 20 x 14 | 220 | 1,120 | 200 |
| 20 x 14 | 220 | 1,130 | 200 |
| 32 x 24 | 164 | 3,896 | 700 |

# Hp. Ratings Tables for Leather Belting

BY L. H. SKOUGOR

Research Engineer
American Leather Belting Association

The following tables have been developed to enable the purchaser and user of flat leather belting to set up his own specifications to fit his own application. They are a correlation of scientifically measured tests and field data. Table I lists horsepower transmission capacities for belts one inch wide at varying speed with the same given large size pulley throughout the tests. Tables II and III list correction factors to compensate for such variables as changing the effective area and to take into account various service conditions under which the belts may be used. All three tables should be used in calculations.

Two limitations should be kept in mind: The tables do not apply where speeds over 6,000 ft. per minute are reached, nor to cases where a pivoted base is installed with the tight side away from the pivot point; in both these cases it is recommended that a leather manufacturer be consulted.

## Table I—Horsepower per Inch of Width

| BELT SPEED FEET PER MIN. | SINGLE PLY | | DOUBLE PLY | | | TRIPLE PLY | |
|---|---|---|---|---|---|---|---|
| | *11/64" | *13/64" | *18/64" | *20/64" | *23/64" | *30/64" | *34/64" |
| | MEDIUM | HEAVY | LIGHT | MEDIUM | HEAVY | MEDIUM | HEAVY |
| 600 | 1.1 | 1.2 | 1.5 | 1.8 | 2.2 | 2.5 | 2.8 |
| 800 | 1.4 | 1.7 | 2.0 | 2.4 | 2.9 | 3.3 | 3.6 |
| 1000 | 1.8 | 2.1 | 2.6 | 3.1 | 3.6 | 4.1 | 4.5 |
| 1200 | 2.1 | 2.5 | 3.1 | 3.7 | 4.3 | 4.9 | 5.4 |
| 1400 | 2.5 | 2.9 | 3.5 | 4.3 | 4.9 | 5.7 | 6.3 |
| 1600 | 2.8 | 3.3 | 4.0 | 4.9 | 5.6 | 6.5 | 7.1 |
| 1800 | 3.2 | 3.7 | 4.5 | 5.4 | 6.2 | 7.3 | 8.0 |
| 2000 | 3.5 | 4.1 | 4.9 | 6.0 | 6.9 | 8.1 | 8.9 |
| 2200 | 3.9 | 4.5 | 5.4 | 6.6 | 7.6 | 8.8 | 9.7 |
| 2400 | 4.2 | 4.9 | 5.9 | 7.1 | 8.2 | 9.5 | 10.4 |
| 2600 | 4.5 | 5.3 | 6.3 | 7.7 | 8.9 | 10.3 | 11.0 |
| 2800 | 4.9 | 5.6 | 6.8 | 8.2 | 9.5 | 11.0 | 12.1 |
| 3000 | 5.2 | 5.9 | 7.2 | 8.7 | 10.0 | 11.6 | 12.8 |
| 3200 | 5.4 | 6.3 | 7.6 | 9.2 | 10.6 | 12.3 | 13.5 |
| Minimum Pulley Diameters — Belts Under 8" Wide | 3" | 5" | 6" | 8" | 12" | 20" | 24" |
| Minimum Pulley Diameters — Belts 8" & Over Wide | 5" | 7" | 8" | 10" | 14" | 24" | 30" |
| These are the minimum allowable pulleys for the above thickness belts. | | | | | | | |

| BELT SPEED FEET PER MIN. | SINGLE PLY | | DOUBLE PLY | | | TRIPLE PLY | |
|---|---|---|---|---|---|---|---|
| | *11/64" | *13/64" | *18/64" | *20/64" | *23/64" | *30/64" | *34/64" |
| | MEDIUM | HEAVY | LIGHT | MEDIUM | HEAVY | MEDIUM | HEAVY |
| 3400 | 5.7 | 6.6 | 7.9 | 9.7 | 11.2 | 12.9 | 14.2 |
| 3600 | 5.9 | 6.9 | 8.3 | 10.1 | 11.7 | 13.4 | 14.8 |
| 3800 | 6.2 | 7.1 | 8.7 | 10.5 | 12.2 | 14.0 | 15.4 |
| 4000 | 6.4 | 7.4 | 9.0 | 10.9 | 12.6 | 14.5 | 16.0 |
| 4200 | 6.7 | 7.7 | 9.3 | 11.3 | 13.0 | 15.0 | 16.5 |
| 4400 | 6.9 | 7.9 | 9.6 | 11.7 | 13.4 | 15.4 | 16.9 |
| 4600 | 7.1 | 8.1 | 9.8 | 12.0 | 13.8 | 15.8 | 17.4 |
| 4800 | 7.2 | 8.3 | 10.1 | 12.3 | 14.1 | 16.2 | 17.8 |
| 5000 | 7.4 | 8.4 | 10.3 | 12.5 | 14.3 | 16.5 | 18.2 |
| 5200 | 7.5 | 8.6 | 10.5 | 12.8 | 14.6 | 16.8 | 18.5 |
| 5400 | 7.6 | 8.7 | 10.6 | 12.9 | 14.8 | 17.1 | 18.8 |
| 5600 | 7.7 | 8.8 | 10.8 | 13.1 | 15.0 | 17.3 | 19.0 |
| 5800 | 7.7 | 8.9 | 10.9 | 13.2 | 15.1 | 17.5 | 19.2 |
| 6000 | 7.8 | 8.9 | 10.9 | 13.2 | 15.2 | 17.6 | 19.3 |
| Minimum Pulley Diameters — Belts Under 8" Wide | 3" | 5" | 6" | 8" | 12" | 20" | 24" |
| Minimum Pulley Diameters — Belts 8" & Over Wide | 5" | 7" | 8" | 10" | 14" | 24" | 30" |
| These are the minimum allowable pulleys for the above thickness belts. | | | | | | | |

## Table II—Correction Factor for Center Distance and Small Pulley Diameter

| Diameter Small Pulley Inches | CENTER DISTANCE IN FEET | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Up to 4' | | 6' | | 8' | | 10' | | 12' | | 15' | | 20' | | 25' & Over | |
| | Tight Side | | Tight Side | | Tight Side | | Tight Side | | Tight Side | | Tight Side | | Tight Side | | Tight Side | |
| | ABOVE | BELOW | ABOVE | BELOW | ABOVE | BELOW | ABOVE | BELOW | ABOVE | BELOW | ABOVE | BELOW | ABOVE | BELOW | ABOVE | BELOW |
| 3" | .45 | .45 | .46 | .47 | .47 | .48 | .47 | .49 | .48 | .50 | .49 | .52 | .48 | .54 | .48 | .55 |
| 4" | .53 | .53 | .54 | .55 | .55 | .57 | .56 | .59 | .57 | .61 | .58 | .63 | .59 | .65 | .59 | .66 |
| 5" | .59 | .59 | .60 | .62 | .62 | .64 | .63 | .66 | .63 | .68 | .65 | .70 | .66 | .72 | .66 | .74 |
| 6" | .62 | .62 | .63 | .65 | .65 | .68 | .66 | .70 | .67 | .72 | .68 | .74 | .69 | .76 | .70 | .78 |
| 8" | .66 | .66 | .67 | .69 | .69 | .72 | .70 | .74 | .71 | .76 | .72 | .78 | .73 | .80 | .74 | .82 |
| 10" | .68 | .68 | .70 | .71 | .71 | .74 | .73 | .77 | .73 | .79 | .75 | .81 | .76 | .83 | .77 | .85 |
| 12" | .70 | .70 | .72 | .74 | .73 | .77 | .75 | .79 | .76 | .81 | .77 | .83 | .78 | .86 | .79 | .88 |
| 15" | .73 | .73 | .74 | .76 | .76 | .79 | .77 | .82 | .78 | .84 | .80 | .86 | .81 | .89 | .82 | .91 |
| 18" | .75 | .75 | .76 | .78 | .78 | .81 | .79 | .84 | .80 | .86 | .82 | .89 | .83 | .91 | .84 | .93 |
| 24" | .77 | .77 | .79 | .81 | .81 | .84 | .82 | .87 | .83 | .89 | .85 | .92 | .86 | .94 | .87 | .96 |
| 30" | .79 | .79 | .81 | .82 | .82 | .86 | .84 | .89 | .85 | .91 | .87 | .94 | .88 | .96 | .89 | .98 |
| 36" | .80 | .80 | .82 | .84 | .83 | .87 | .85 | .90 | .86 | .92 | .88 | .95 | .89 | .98 | .90 | 1.00 |

NOTE—Consider gravity idler and pivoted motor drives with tight side of the belt next to the pivot point as having 25-ft. centers.

### Example

Problem: Select belt for following drive:

Motor—10 hp., 1,750 r.p.m., line start, induction. Pulley, 6 in. diameter by 6¾ in. face fibre.
Compressor—Started automatically against pressure. Pulley 30 in. diameter by 6½ in. face.
Conditions—Tight side of belt below, pulleys 6 ft. center to center, center line approximately horizontal, important refrigeration service, normal atmospheric conditions.

Selection of factors:

Belt speed $\frac{6 \times 3.14 \times 1750}{12} = 2{,}750$ ft. per minute.

From Table I, light double belt suited for 6 in. diameter pulley.
From Table I, light double belt will transmit 6.7 hp. per inch of width at 2,750 ft. per minute.
From Table II, factor for center distance and small pulley diameter is 0.65.
From Table III, other factors are: Atmospheric condition, 1.0; angle of center line, 1.0; pulley material, 1.2; service, 0.8; peak load, 0.6.

Calculation:

$$\frac{10}{6.7 \times 0.65 \times 1.0 \times 1.0 \times 1.2 \times 0.8 \times 0.6} = 3.99 \text{ in.}$$

Therefore, use 4-in. light double belt.

## Table III—Service Correction Factors

| | | |
|---|---|---|
| Atmospheric Condition | Clean, scheduled maintenance | 1.2 |
| | Normal | 1.0 |
| | Oily, wet or dusty | .7 |
| Angle of Center Line | Horizontal to 60 deg. from horizontal | 1.0 |
| | Horizontal 60 to 75 deg. from horizontal | .9 |
| | Horizontal 75 to 90 deg. from horizontal | .8 |
| Pulley Material | Fibre on motor and small pulleys | 1.2 |
| | Cast iron or steel | 1.0 |
| Service | Temporary or intermittent | 1.2 |
| | Normal | 1.0 |
| | Important or continuous | .8 |
| Peak Loads | Light, steady load such as: steam engines, steam turbines, Diesel engines, and multi-cylinder gasoline engines | 1.0 |
| | Jerky loads, reciprocating machines such as: normal starting torque squirrel-cage motors, shunt-wound d.c. motors and single-cylinder gasoline engines. | .8 |
| | Shock and reversing loads, full voltage start such as: wound-rotor (slip-ring) motors, synchronous motors | .6 |

# Simplex-TIREX

## rubber sheathed cords and cables

# "cured in lead"

Simplex developed and still uses exclusively the process of curing TIREX cords and cables in lead. Every foot of TIREX cords or cables ever made has been "cured in lead." True, it is an expensive process but look what you get out of it. TIREX cords and cables have a dense, firm, smooth jacket that does not catch on projections. This rubber jacket is the most wear resistant protection available for flexible cords and cables.

The long life and neat appearance of the modern portable cord or cable is due, in a large measure, to the research and experiment conducted years ago by Simplex. It was Simplex that pioneered the vulcanization of the sheaths of portable cords and cables after they had been molded under pressure.

All this research and experiment has been done to give you a cord or cable that will serve you better and longer. TIREX cords and cables will lower your cord and cable costs to a minimum.

Nearly twenty years ago Simplex-TIREX was designed for hard service after an exhaustive study of portable equipment requirements and with a complete understanding of the short-comings of the former types of cables used for such service. The original TIREX was unexcelled for flexibility, abrasion resistance and electrical qualities. Improvements during recent years have served only to intensify these valuable qualities.

TIREX
SELENIUM
Rubber Armor
Unequalled for Long Life Toughness and Resistance to Abrasion.

An outstanding feature of all TIREX cords and cables is the selenium rubber armor. It is a 60% rubber sheath properly compounded and vulcanized with selenium to obtain maximum toughness. The **selenium rubber armor** is a distinguishing feature of all TIREX cables and it makes them unexcelled for toughness and resistance to abrasion.

**Simplex Wire & Cable Company, 79 Sidney Street, Cambridge, Mass.**

# Simplex-TIREX

## The only cable armored with Selenium Rubber

# NEW ENGINEERING IDEAS

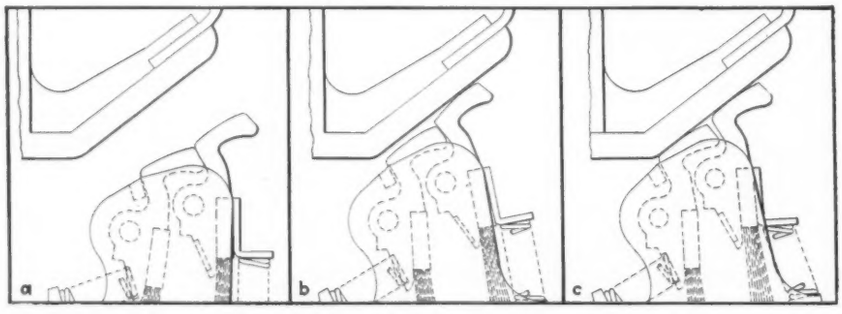
## Magnetic Refinements Extend Contactors

By J. F. FRESE
Chief Engineer
Monitor Controller Company, Philadelphia, Pa.

Promptness and positiveness of blowout as well as minimized contact resistance were recognized as major problems in extending polyphase contactors from 300 to 600 and 1,200 amp. High efficiency of the magnetic blowout circuit in new 600- and 1,200-amp. contactors is assured by two important design factors. First, the side plates of the blowouts are turned at right angles toward each other along their outer edges, greatly diminishing the length of the air gap. By this means the flux is definitely concentrated where it is most needed. This feature is enhanced by the new arrangement of the contacts, discussed further in the next paragraph, which allows the side plates to be placed close together. Second, the magnetic field is kept in phase with the current in the arc path by lamination of both the blowout core and the blowout side plates. In this way lagging of the blowout field behind arc current is prevented and possibility of "blow-down" or "no-blow" eliminated. As a result of these two improvements, in tests made at 550 volts, 60 cycles with an air-core reactor, currents as low as 300 amp. and as high as approximately 12,000 amp. have been successfully interrupted in an arcing time of from 0.53 to 1.4 cycles by the 1,200-amp. device.

The actuating mechanism of both sizes is a vertical plunger solenoid. The motion of the plunger is transferred to the contact shaft through a toggle system so designed that it provides both maximum speed in contact opening and maximum pressure when contacts are closed—a fact that seems paradoxical at first glance.

Rebound at the end of the opening travel is positively prevented by proportioning the momentum and gravity moments of the dropping contactor arms so as to offset the tendency of the solenoid core to start upward after striking the leather shock-absorbing pad.




**Enlarged capacity contactor has sequential contacts**

(a) Contacts open. (b) Contacts closing or opening. (c) Contacts closed.

Compact construction of the contacts is obtained by mounting 1-in. wide contact tips one above the other in such relationship that the lower contact makes after and breaks before the upper contact (See sketches). Thus the final break of the circuit occurs on the toe of the upper contact, at a point which is not in use during the closed period. The current-carrying surfaces of both contacts remain smooth and clean even after prolonged interruption tests. In the 600-amp. size only one pair of these contacts is used per pole. In the 1,200-amp. size two pairs are used side by side, providing 4 linear inches of copper to copper contact in a width only slightly exceeding 2 in., making it possible to bring the pole faces of the magnetic blowouts closer together than ever before. Naturally, the flux is more concentrated and blowout is swifter and surer.

•

## Roller Gate Design Effects Cost Saving

By C. R. MARTIN
Hydraulic Department
Allis-Chalmers Manufacturing Company

Although 133 roller gates for floodwater control have been built and installed in this country since their introduction in 1916 from Europe, they have been expensive and have contained certain objectionable mechanical features. U. S. patent No. 2,132,307, granted to the author October 4, 1938, covers changes in roller gate design that materially reduce cost and improve mechanical design. The essential differences between the old and new forms appear in an accompanying illustration.

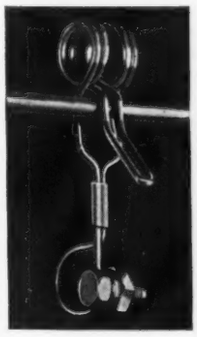
Comparison between the old and new designs for a gate 80 ft. long and with 25 ft. damming height shows these differences, in specific terms:

| | Old | New |
|---|---|---|
| Weight of rotating drum assembly (lb.) | 360,000 | 260,000 |
| Drum diameter | 16 ft. 6 in. | 18 ft. 6 in. |
| Rolling circle | 18 ft. 6 in. | 16 ft. 0 in. |
| Chain pull to raise gate (lb.) | 360,000 | 176,000 |

The weight saved by the new gate in the rotating parts is 100,000 lb.

# FREE—Learn how to make low cost taps—with these—

## SPRING-TYPE CON-NEC-TAP CLAMPS



AND NOW—careful engineering design makes it possible to make really low cost taps—for tapping small transformers to the line—for tapping lightning arresters and low capacity taps—easily, surely and conveniently with this very simple, sturdy and inexpensive Kearney Spring-type Con-Nec-Tap Clamp. ... Fast, too, because to install, you merely snap them onto the conductor ... To remove, merely insert finger of either disconnect, tie or Safe-T-Hook Clampstick in top loop—push up and unsnap the clamp.

And this newly designed spring-type clamp has still another important mechanical feature: Its spring-type construction gives constant contact pressure on the conductor ... Unaffected by vibration, contraction or expansion, the 40%, No. 8 high strength Copperweld Spring Contacts maintain pressures on conductor from 14 to 32 pounds, depending on conductor diameter.

***Variety of Clamps***

Use them on copper, aluminum or iron conductors—three types are available. These clamps are made to handle wire sizes up to 250 M. C. M. Copper or No. 2 ACSR over the armor rod.

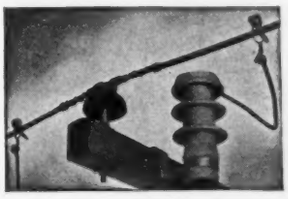
***Many Satisfied Users***

These are the clamps that many operating men have tested out during the past two years—without one single complaint, but with many favorable comments about their efficient performance and economical applications.

***Free Trial Offer***

And now, we'd like for you to see why there's been such enthusiastic reports about this simple, practical Kearney Spring-type Con-Nec-Tap Clamp that has full carrying capacity equivalent to the normal capacity of No. 6 solid jumper wire.

Take advantage of the FREE offer to see how you can make low cost taps ... Just mail the coupon today.



*Lower costs of tapping lightning arresters made possible by using inexpensive Kearney Spring-type Con-Nec-Tap Clamps.*

●

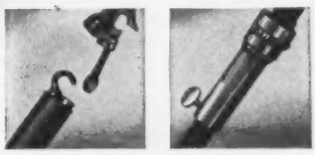
*For operating men dealing with lines of 5000 volts or more, Bulletin 331 affords a guide to practical and economical purchases.*

## SAFE-T HOOK STICK

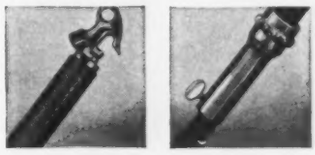
*with* EXCLUSIVE KEARNEY FEATURES

ELIMINATE arcing and pitting on the conductor when picking up a load with live line clamps, by using a modern SAFE-T Hook Stick that operates positively and safely ... for use on all mechanical styles of eye-screw type clamps or on the Kearney Spring-type Con-Nec-Tap Clamp. Ask for trial order.

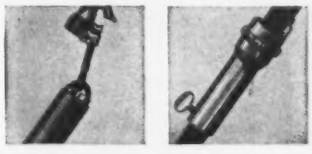
***Simple to Operate***



*Locking collar turns right — grip pushes forward and opens the hook.*



*Grip pulled down, held in installing position by hand or thumb screw.*



*Grip released, allows hook to be pulled out into operating position.*

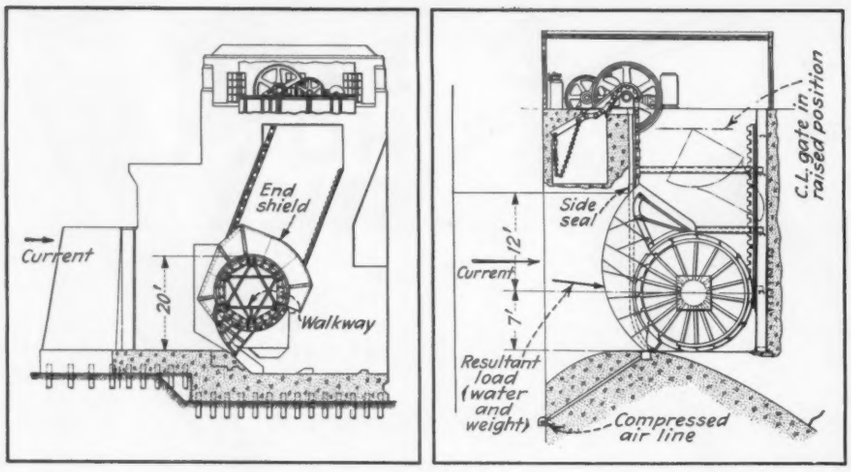
JAMES R. KEARNEY CORPORATION
4224-42 Clayton Ave., St. Louis, Mo.

I'm checking below what I want you to send:

☐ FREE SAMPLE CON-NEC-TAP CLAMP
☐ 30-DAY TRIAL ORDER SAFE-T HOOK STICK
State Length..... ☐ Hi-LINE CATALOG

Name.....
Company.....
Address.....

**KEARNEY-UTILITY EQUIPMENT**




**Improved roller gate design (right) effects 25 per cent saving over old form (left)**

and the chain pull is reduced 184,000 lb. Along with the saving in weight of the rotating parts is a simplified design which reduces the manufacturing costs. These savings in the cost of the roller gate are produced by a happy solution to the problem of balancing the water pressures acting on the gate in a manner that reduces the chain pull without destroying the self-closing feature common to all roller gates.

Here are summarized briefly the changes in design and field constructions that have resulted from the new method of balancing the gate:

1. Drum is at bottom of gate and the line of resultant water pressure acts through a low point on the pier.
2. With the chain pull reduced to a minimum, the gate can be made to lift vertically and the up- and down-stream length of the piers shortened.
3. Shearing stresses in the drum are decreased with the drum at the bottom of the gate and with the line of resultant water pressures acting through or near the centerline of the drum.
4. The apron is placed on top of the drum and can be made with one-half the weight of an apron located below the drum. Furthermore, the top apron can be set upstream of the drum, giving clearance for the drum to raise past the ice sheet; its top curvature is made to pull away from the ice on raising, and ice pressure causes only slight opening of the gate.
5. The ends of the gate which transmit the load from the drum to the piers are made separate and smaller in size.
6. The vertical lift gate permits a common structural steel frame for carrying the stationary tracks located in the pier recesses, for supporting the guard rail that holds the gear teeth on gate ends and track in mesh, for mounting the side seals and for holding the forms in place when the concrete piers are poured.
7. The side seals are made expansible to insure a tight seal and to reduce cost of the rotating parts of the gate.
8. The lifting force for the new gate is one-half the chain pull required for former designs.

## Research Generator Tenth Usual Size

Space-conserving features have been incorporated in the very newest electrostatic generator at Massachusetts Institute of Technology—a 1,250,000-volt machine that produces short-wave X-rays for scientific and engineering research. One goal of the research at "Tech" is to develop high-voltage apparatus that will produce rays equivalent to the gamma rays of radium. The new generator will also be used to study radiation intensity variations, with voltage changes, thickness of copper required to reduce ray intensities to half normal values and depth dose measurements.

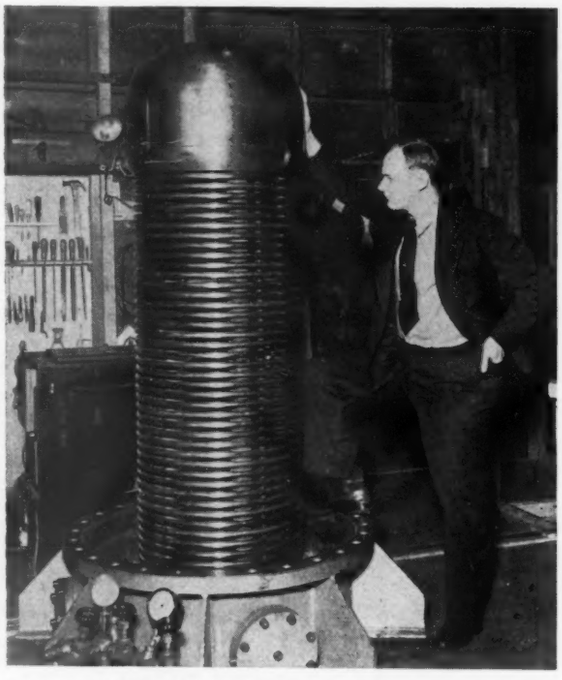
The machine is one-tenth the size of a million-volt generator, designed by Doctors Trump and Van de Graff, that has been in use at Huntington Memorial Hospital, Boston, since 1937. It is housed in a sealed tank less than 3 ft. in diameter and but 9 ft. high and operates in air at 150 lb. per square inch pressure.

### *Generator Construction*

In construction the generator employs the belt conveyor principle used in earlier Van de Graff machines. It employs a hollow brass shell as a high-potential terminal, supported and insulated from the ground base by several columns. But one belt, and that 14 in. wide, is required, as contrasted with six 36-in. belts in the Huntington Hospital machine. The belt travels at about 60 m.p.h. Forty brass equipotential rings spaced about an inch apart surround the insulating columns and insure proper grading of voltage between terminal and ground.

The X-ray tube, which is located within the equipotential rings between the terminal and the base, is of the customary multiple-acceleration type. Electrons are accelerated down the tube by the full generator voltage and impinge at very high velocity upon a water-cooled gold target at the grounded end of the X-ray tube which extends down into the treatment room on the floor below where the X-rays are produced. A 4-in. sheath of lead completely surrounds the target except for a portal at the bottom through which the X-ray beam passes to the patient.

The new generator is expected to be operated usually at 1,250,000 volts, but it can be operated over the whole range from the maximum down to 500,000 for medical purposes and down to 200,000 volts for scientific and engineering research.

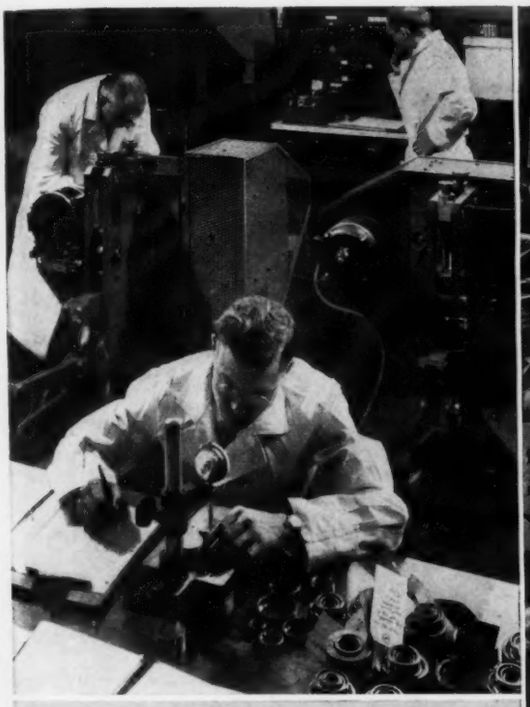


**Recent 1,250,000-volt electrostatic generator occupies under 21 sq.ft.**

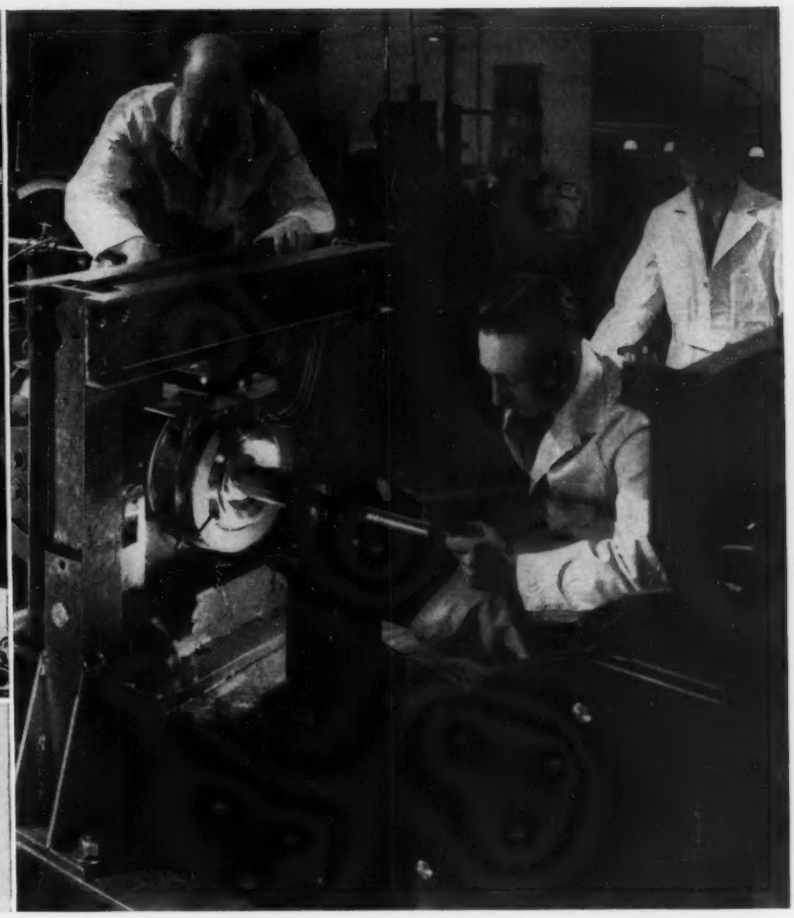
New unit for the Massachusetts General Hospital designed at M.I.T. by Dr. John G. Trump, right

# RESEARCH IN LUBRICATION

## has created an extra margin of safety in GULF PRODUCTS



This experimental equipment — designed and built in the Gulf Research Laboratory — is used to test bearing lubricants under a wider range of operating conditions than are encountered in actual service. Thus Gulf's field engineers are able to recommend lubricants for specific applications which not only meet the prevailing conditions, but provide an *extra margin of operating safety.*



**GULF TECHNOLOGISTS** *test bearing oils under load and temperature conditions far more severe than are encountered in actual service.*

WHAT changes take place in an oil under severe service? What is its rate of oxidation? What is the safest oil to use for a particular type of bearing? Answers to these and many other questions regarding lubricants are being accurately determined each day in Gulf's modern research laboratory.

Special machines, designed and built expressly for this experimental work, not only duplicate the conditions under which oils must perform in service, but set up still more severe conditions in order to insure an extra margin of operating safety for the lubricant under test. Thus, the knowledge gained by many years of practical experience in lubricating machinery of all types can be supplemented with newly developed facts.

There is a Gulf quality lubricant which will insure minimum wear and long life for every bearing and moving part in your plant. Ask the Gulf engineer who calls on you to recommend the oils and greases best suited to your needs. They are quickly available to you through more than 1100 Gulf warehouses in 28 states . . . Gulf Oil Corporation—Gulf Refining Company, Pittsburgh, Pennsylvania.

GULF INDUSTRIAL LUBRICATION

Also A COMPLETE LINE OF FUEL AND FURNACE OILS

# LOAD BUILDING

## Using the User Sells 297 Kitchens

While lawyers were spending three days to search title for a proposed housing project, officials of Carolina Power & Light Company proceeded to sell the architect of two new FHA-sponsored apartment house projects in Raleigh, N. C., upon the practicability of electric kitchens. By obtaining power bills and testimonials from every apartment renter in an already existent nearby electrified apartment house, to clinch the story, 297 kitchen equipments were supplied by the General Electric Company.

The apartments run from 2 to 4½ rooms and indicative of the renting charge is a bachelor suite consisting of a large living room, dressing room, bath and an electric kitchen, which rents for $37.50 per month.

The electric kitchens are identical in every apartment of both developments. Unit kitchens consist of three-section steel wall cabinets, sink, refrigerator, range and built-in ventilating fan.

•

## Houston Stresses Adequate Wiring

By H. E. DORRILL
Sales Promotion Supervisor
Houston Lighting & Power Company,
Houston, Tex.

We consider our sales activities on adequate wiring one of our most important promotions because in a majority of cases No. 14 wire is being used in all residential construction throughout this territory.

Last year there were more than 3,000 residential buildings constructed in Houston and new construction throughout the rest of our territory was in proportion. As the city was without a wiring ordinance of any kind during the greater part of last year, we did not undertake the promotion of adequate wiring in this territory. However, this year we are aggressively promoting adequate wiring through our entire sales department.

We have in our sales organization 40 home service advisers whose duty it is to call on all residential customers with a view to selling additional usage of old equipment as well as new services. These girls have specific zones assigned to them and in our adequate wiring activities for 1939 each girl is held responsible for the new residential construction that is carried on in her particular district.

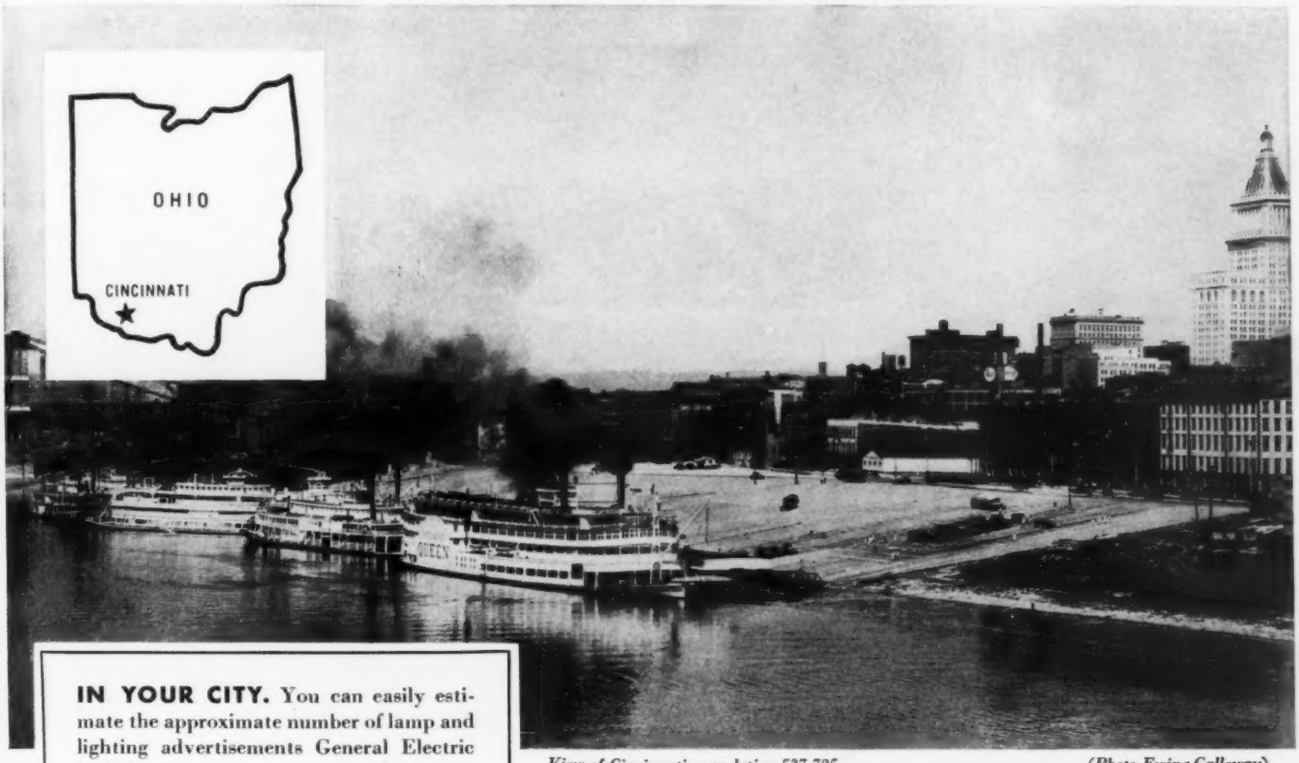
In our commercial sales department we have fifteen representatives who are held responsible for adequate wiring in all new commercial construction. In addition, we have two home planning counselors who work out of our sales promotion division, and it is their duty to promote adequate wiring by calling on architects and speculative builders. These calls will be made while the plans are crystallizing and before actual construction starts.

An aggressive advertising program on adequate wiring is now under way. This advertising consists of regular weekly advertisements in the real estate section of local newspapers, of monthly bill inserts to approximately 115,000 residential customers, and 35 billboards, eighteen of which are illuminated to carry a message on adequate wiring. Finally, we are featuring adequate wiring monthly in our three trade papers, and have prepared window display cards on adequate wiring to be used by electrical supply dealers, appli-

**Using the user enabled Carolina Power & Light Company to promote the sale of 297 kitchens in FHA-sponsored housing project. The kitchen shown is a typical example**

# Selling lamps and lighting in CINCINNATI, OHIO

## *(and cities of similar size)*




*View of Cincinnati, population 537,725* *(Photo-Ewing Galloway)*

**IN YOUR CITY.** You can easily estimate the approximate number of lamp and lighting advertisements General Electric is delivering to your customers by applying the following national averages:

***Going into the average wired home in 1939***

14 magazines with G-E lamp ads
5 newspapers with G-E lamp ads
5 radio messages

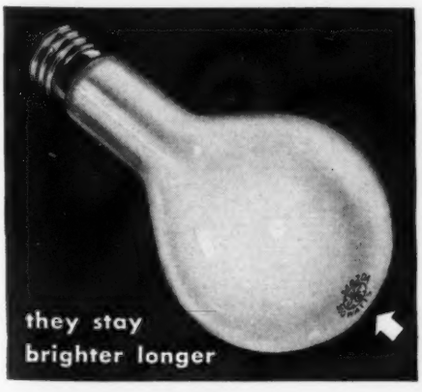
24 total advertising messages

• • •

***In the last 10 years, the average wired home received***

158 magazines with G-E lamp ads
30 newspapers with G-E lamp ads
20 radio messages

208 total advertising messages




HERE'S a composite view of the way that General Electric lamp advertising is constantly at work in Cincinnati, promoting light-conditioning for Better Light-Better Sight. Into Cincinnati homes every week goes a steady stream of G-E lamp and lighting advertisements amounting to 50 impressions per person in the last ten years.

**IN 1939 . . .** 1,860,000 magazines with G-E lamp advertisements and 675,000 radio messages.

**SINCE 1929 . . .** 19,623,000 magazines with G-E lamp advertisements.

**FALL 1938 . . .** 1,305,000 copies of Cincinnati newspapers with G-E lamp advertisements.

**LAST 3 YEARS . . .** 6,925,000 newspapers with G-E lamp advertisements.

**SINCE 1929 . . .** 27,223,000 advertisements in magazines, newspapers, and radio. Which is . . . approximately 50 advertisements per capita.

**GENERAL ELECTRIC**
**MAZDA LAMPS**

**Fifty foot-candles are provided in this sight-saving classroom of the George Washington School at Marion, Ohio**

Six 750-watt Silvray fixtures with silvered-bowl lamps controlled by photoelectric cell on the front blackboard protect the minimum lighting level. Working plane of desks is adjustable to various angles. Printing in textbooks and all writing materials are much larger than customary sizes employed.

ance dealers and other windows for the purpose of creating more interest in adequate wiring.

•

## Sight-Saving Room for Marion, Ohio

By JOHN E. ARTOPOEUS
Marion Reserve Power Company
Marion, Ohio

The state of Ohio requires a minimum of 30 ft.-candles in sight-saving classrooms. However, those interested in a proposed sight-saving room for the George Washington School in Marion were convinced that every one concerned would be more pleased if equipment large enough to maintain 50 ft.-candles were to be installed. The classroom selected was a normal 22x32-ft. room, the ceiling painted a flat white and side walls in ivory. In choosing the fixtures it was found that six 750-watt Silvray fixtures with silvered-bowl lamps would give the desired level of illumination.

A photoelectric cell is mounted on the front blackboard (see illustration) and controls the outer row of lights so that at no time does the lighting intensity fall below 50 ft.-candles.

The painting of this room was a problem, inasmuch as after the work of installation was started there were only a few days to complete the job. By using the new casein water-base paint several days' time was saved. The whole room was painted in four hours and in another four hours the paint was dry and there was no unpleasant odor of paint.

Chairs, tables and desks are finished in dull varnish, which eliminates glare. The desk tops are adjusted to various heights so that they can be tilted to any desired angle from a horizontal to a vertical plane in order that books may be at the correct eye angle, while the pupils are sitting at the desks.

In addition, all books and lighting materials are much larger than those used in an ordinary classroom. The printing in the textbook is about three times the size of the print used in standard textbooks. The chalk used at the blackboard is several times the regular size and that makes larger marks.

•

## Only Two Forms for Jersey Central

Only two forms are required by the Jersey Central Power & Light Company for the operation and control of its industrial and commercial lighting department.

Salesmen personally prepare the original field record (Fig. 1), which provides a brief report of what happened on the call and the salesman's figures on net increase in installed watts as a result of the call.

Clerks summarize these field reports on the general office records as shown in Fig. 2 (face and obverse). This record provides for entries for 28 field reports, for an original and two succeeding customers at the same location and for a chronological call-up tab system shown in upper right margin.

Finally, audit of the summary is provided by the "KWH Sales Summary," taken from written book records which show actual consumption.

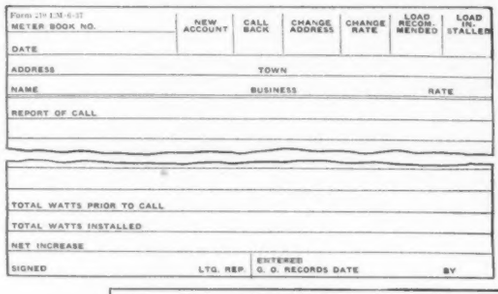



**Fig. 1—Field report used by commercial and industrial lighting salesmen of Jersey Central Power & Light requires only one other form to complete sales records**

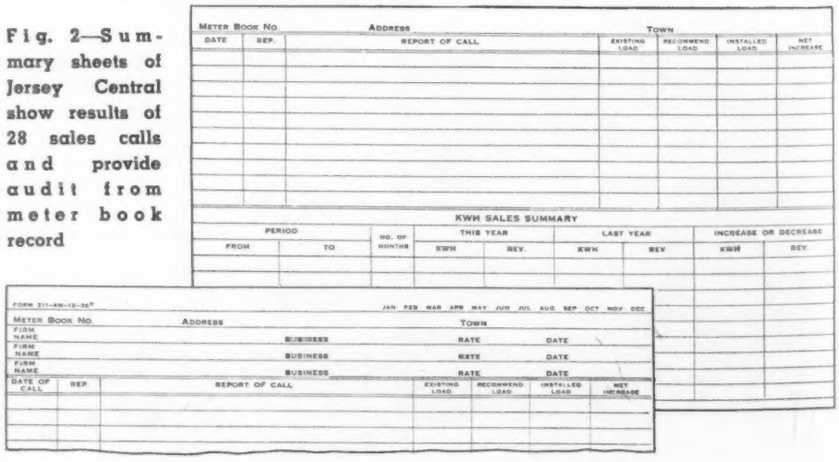



**Fig. 2—Summary sheets of Jersey Central show results of 28 sales calls and provide audit from meter book record**

# . . . letters that spell "IT SAVES US MONEY"

• These "bouquets" from a few users of the *"Shield-Arc Jr."* in one district, express a sentiment that is the same the world over regarding this low-priced Lincoln d. c. welder. A typical statement is, "Our Lincoln Welder has paid for itself out of savings in one month's time. It is the most profitable tool in our shop."

Investigate the New *"Shield-Arc Jr."* (illustrated above). Its "Job Selector" and Current Control are Self-Indicating and continuous in operation, simplifying welding and assuring maximum welding speed and quality for lower costs. Available in ratings of 75, 100 and 150 amps. Priced exceptionally low. Consult the nearest Lincoln office or mail the coupon today for details.

**LINCOLN**

LARGEST MANUFACTURERS OF ARC WELDING EQUIPMENT IN THE WORLD

**THE LINCOLN ELECTRIC COMPANY**
**Dept. U-593, Cleveland, Ohio**

We now use (check which) ☐ arc ☐ gas ☐ none.
Send bulletin on New *"Shield-Arc Jr."*

Name _____ Position _____

Company _____

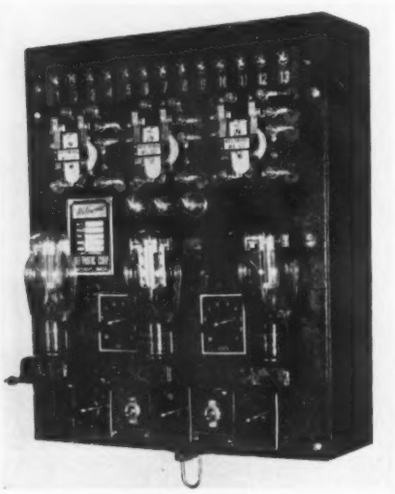
Address _____

City _____ State _____

# NEW EQUIPMENT

## Welding Timer

New line of electronic welding timers, designed for use with gun, spot, projection and automatic welding equipment, comprises models ranging in applications



Electronic welding timers; for standard voltages of 110, 220, 440 or 550 with frequencies of 25, 50 or 60 cycles and push-button control voltages of 110, 220 or 6 volts. **Weltronic Corp.**, Detroit, Mich.

from single spots to multiple automatic spot welding. Controls available include models for: Regulation of start of welding current; setting of cut-off time of current; "cooling" time control to regulate length of time electrodes will remain in contact with work after welding current has been cut off to permit annealing of the work; producing number of interruptions of current during the welding operation; regulation of length of welding time in cycles; time delay before welding current goes on after the electrode pressure has been built up. The company calls particular attention to a controlled interrupted time model, which permits the welding of thick sections—up to ½ in. each.

•

## Radio Noise Records

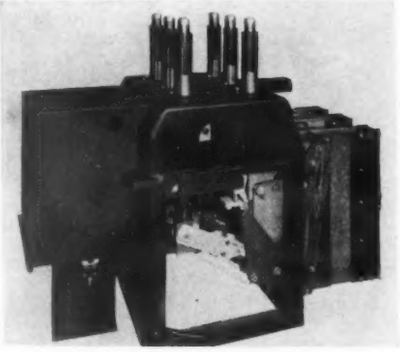
Radio noise records; typical record carried on 12-in. double-faced disk making 78 r.p.m. **Tobe Deutschmann Corp.**, Canton, Mass.

To aid the study and demonstration of radio interference noises on power systems, this company is releasing—to power companies exclusively—records for reproduction purposes, as obtained with the company's interference locator. One side carries examples of noise originating on transmission and distribution systems. The reverse carries noises produced by defects in wiring and by household, commercial and industrial apparatus. Accompanying the transcription, which is free from continuity, is a noise manual emphasizing the individual characteristics of each noise reproduced and suggesting a technique for locating the noise source and methods of stopping interference.

•

## Air Circuit Breaker

When the contacts of this air circuit breaker part the arc is magnetically driven into a specially constructed chute which confines and speedily interrupts the arc. This operating principle is said so to improve the power factor of the fault that when the interruption occurs the power factor at interruption is close to unity. Main contacts are silver-to-silver and arcing contacts are silver alloy. Device was developed for use with the company's vertical-lift, metal-clad switchgear.



"Magne-Blast" air circuit breaker; for 5,000-volt, three-phase service. **General Electric Co.**, Schenectady, N. Y.

•

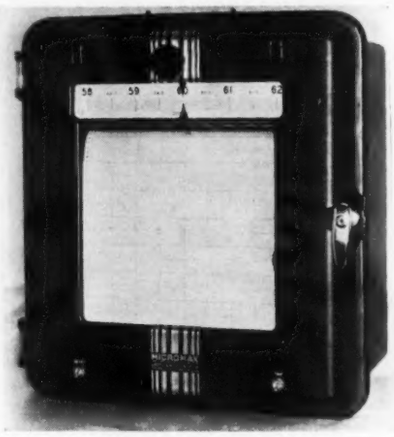
## Industrial Enamel

"Kem Lustral" enamel. **Sherwin-Williams Co.**, Cleveland, Ohio.

Electric utilities, manufacturers and industrial plants are seen as potential users of a new synthetic-resin enamel. Versatility is an outstanding feature of the new product; it may be brushed, sprayed, dipped, air-dried or baked on, and applied to wood or metal surfaces subject to interior or exterior exposure.

## Frequency Controller

A new industral-type frequency controller has been developed to provide smaller central stations and industrial plants in general



"Micromax" frequency controller, industrial type; ranges from 58-62 cycles, 48-52 cycles or 23-27 cycles. **Leeds & Northrup Co.**, Philadelphia, Pa.

with automatic control of frequency, heretofore thought feasible only for large central stations on interconnected systems. Frequency indicator and automatic controller, minus the refinements necessary for the large central stations, are combined in one compact case. Switches on the case set and trip the control; knob at the top sets the base frequency—25, 50 or 60 cycles—and lights on either side show whether the control is on or off.

•

## Safety Transformer

In damp or otherwise hazardous locations, where contact with a 110-volt lighting circuit might cause a fatal injury, the use of a low voltage, such as 32 volts, for the operation of portable extension lamps is gaining prominence. For such use, this

"Safety-Tran;" rated at 50 watts, 110 to 32 volts, 60 cycles. **Newark Transformer Co.**, Newark, N. J.

# A New Rubber Insulation
# Simplex-ANHYDREX AA-LL
# for wires and cables

**Combining for the first time in one 60% rubber insulation long-life, heat-resistance and low water absorption.**

This latest development of the Simplex research laboratories is creating plenty of comment and lots of eyebrow lifting when engineers see what it will do.

This new insulation, Simplex-ANHYDREX AA-LL, is the result of four lines of research continuously carried on for many years in Simplex laboratories.

1. Research to determine the cause of moisture absorption by rubber.
2. Studies of the physical deterioration of vulcanized rubber.
3. Development of heat resistant rubber compounds.
4. Development of rubber compounds with high electrical properties.

In Simplex-Anhydrex AA-LL we now offer a new, 60% rubber insulation which retains the electrical superiority of Simplex-ANHYDREX AA-60 and, in addition, has such high heat resistance that it will satisfy any of the existing specifications for superaging or heat resistant rubber insulation.

In ANHYDREX AA-LL we have added, the long life (LL) heretofore found only in superaging insulations, to the unusual electrical and physical qualities which have caused such ready acceptance and approval of ANHYDREX AA-60.

If you want to know more about this revolutionary rubber insulation, and we are sure you will, just a post card will bring you the information you want. Send it today.

**This new rubber insulation represents a startling advance in the technique of rubber compounding. It is definitely the most important development in rubber insulating compounds since the Simplex Co. announced the perfection in 1932 of the compound known as Simplex-ANHYDREX AA**

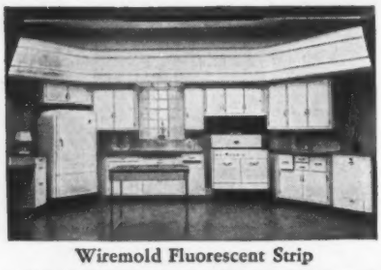
**Simplex Wire & Cable Company, 79 Sidney Street, Cambridge, Mass.**

## Simplex-ANHYDREX
**deproteinized rubber insulation for wires and cables**

ADEQUATE WIRING SERVES AND SAVES

Get to know Wiremold

WIREMOLD WIRING SYSTEMS
make it easier for you to sell
HIGHER LIGHTING STANDARDS



Wiremold Fluorescent Strip

Wiremold Surface Wiring System

Plugmold Multi-Outlet Assembly

What is your greatest stumbling block in selling higher lighting standards? Usually it is the unwillingness of customers to contemplate more or less costly wiring changes and additions.

Wiremold Systems cut right through this kind of sales resistance. Because Wiremold is quickly installed without costly structural changes and can be interconnected easily with existing facilities.

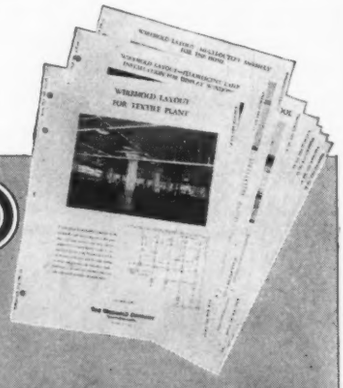
Wiremold is endlessly FLEXIBLE in meeting all wiring needs . . . residential, commercial, industrial. It gives you the latest equipment and methods for installing the new Fluorescent Strip Lighting and Lumiline. In short, Wiremold makes easier going for both your engineering department and your sales department. You should indeed "get to know Wiremold".

USE WIREMOLD DATA SHEET SERVICE FREELY . . .

Wiremold Data Sheets and the help of experienced Wiremold Engineers are always available to help you in selling adequate wiring, better lighting, higher standards of service to your customers. Write us today.

THE WIREMOLD COMPANY - HARTFORD, CONN.

SOUND PLANNING
SOUND ENGINEERING
SOUND SELLING



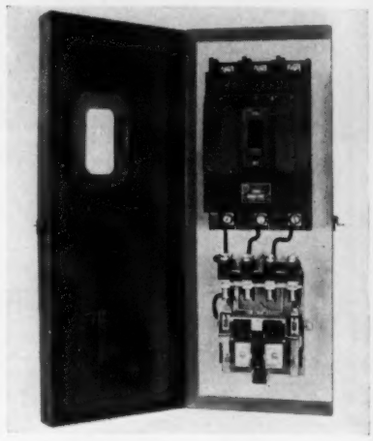
WIREMOLD
Your
LOAD BUILDER

step-down transformer is offered; it is cut into the portable extension lamp cord, the plug section of the cord being connected to the 110-volt side and the lamp socket extension of the cord to the 32-volt side of the device. Since there is no exposed metal, the case being of a phenolic composition, a ground wire is unnecessary.

•

## Motor Starter and Breaker

Air motor starter and circuit breaker are combined in this unit. Circuit breaker is manually operated and trip-free from the handle. It provides short-circuit protection



Type "AP-7DB" motor starter and breaker; starter unit for 7½-hp., 550-volt motors or smaller units; breaker has interrupting capacity of 5,000 r.m.s. amp. in 220-volt starters and 10,000 r.m.s. in 440- and 550-volt starters. **Allis-Chalmers Mfg. Co.**, Milwaukee, Wis.

while at the same time serving as a motor circuit switch. Time delay overload protection is provided by temperature overload relays in the motor starter unit.

•

## Insulation Test Set

Offered for laboratory or production use in routine insulation tests, this leakage resistance test set is an adaptation of the Wheatstone bridge, using an "electron ray" tube as a null detector instead of the more conventional galvanometer. It operates from an a.c. supply and has a self-contained d.c. supply for the bridge circuit and the tube.

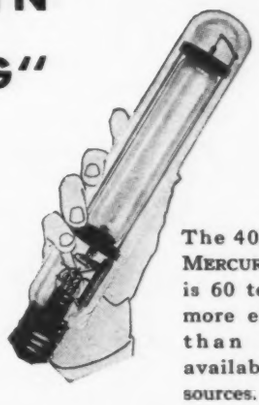
"Megabridge" Series MB; resistance ranges covered include from 100,000 ohms to 100,000 megohms; for operation on 115 volts, 50-60 cycles; models also offered for 115-230 volts, 25-60 cycles. **Industrial Instruments, Inc.**, Bayonne, N. J.

To obtain the resistance of the sample under test the pointer is rotated until the opening of the null indicator remains unchanged with the detector button depressed. As an aid to rapid testing of electrical condensers and high-capacity cables the device automatically charges the condenser as soon

# No "EYE-TAX" Permitted!

## . . . PLANT BANISHES PROFIT DRAIN WITH "ENGINEERED LIGHTING"

"Eye-Tax" is luxury that no industry can afford. Your Plant's most critical control devices are human eyes. They operate at slow speed in dim areas—and the average industrial lighting is about 5 foot candles. Dim indeed! "Eye-Tax" is inevitable. It steals the energy needed to keep eyes alert and product quality high. » » » Modern lighting, engineered to the job with General Electric Type H Lamps abolishes "Eye-Tax." It provides a truly economical means of obtaining the necessary higher levels of illumination. You get higher light output for the same cost of energy. When blended with incandescent light, these mercury lamps provide illumination which simulates and blends well with daylight. » » » Have a lighting specialist show you how to banish "Eye-Tax" with lighting engineered to fit the job. For complete information, write to the General Electric Vapor Lamp Company at either address given below.



The 400-Watt MERCURY Lamp is 60 to 140% more efficient than other available light sources.

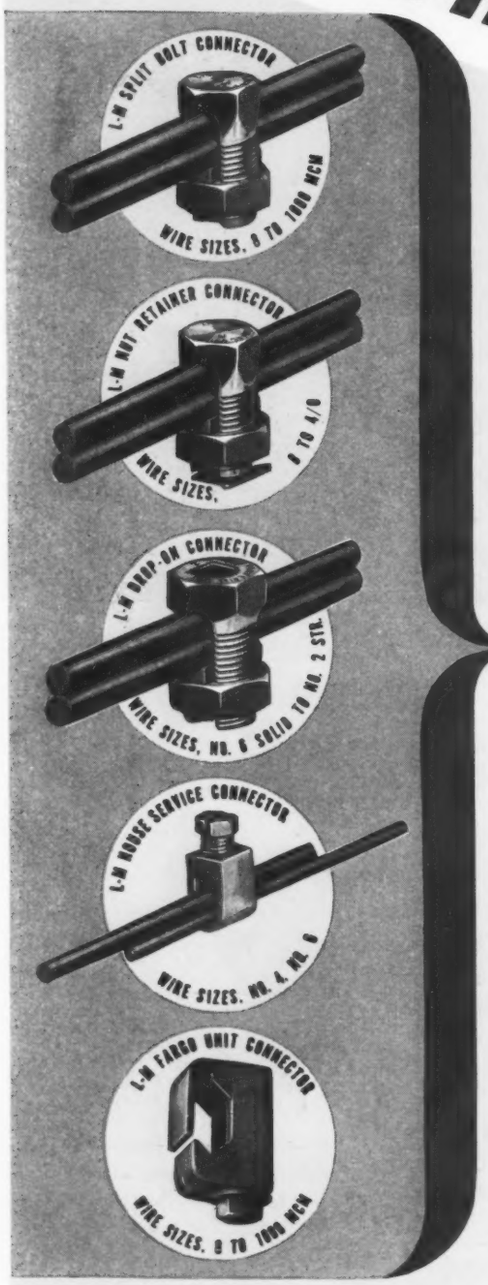
*Order your auxiliary devices which were designed especially for this lamp from the General Electric Vapor Lamp Company.*

**GENERAL ELECTRIC**

**General Electric Vapor Lamp Co.**
805 Adams Street, Hoboken, N. J.

**Incandescent Lamp Department**
Dept. 165, Nela Park, Cleveland, Ohio

# they KEEP their GRIP


L-M SPLIT BOLT CONNECTOR
WIRE SIZES, 8 TO 1000 MCM
L-M NUT RETAINER CONNECTOR
WIRE SIZES, 8 TO 4/0
L-M DROP-ON CONNECTOR
WIRE SIZES, NO. 6 SOLID TO NO. 2 STR.
L-M HOUSE SERVICE CONNECTOR
WIRE SIZES, NO. 4, NO. 6
L-M TARGO UNIT CONNECTOR
WIRE SIZES, 8 TO 1000 MCM

L-M Connectors *hold* conductors in firm, perfect contacts while the years roll on. The extra strong bodies of L-M Connectors resist corrosion, refuse to bend under highest service pressures. Nuts run smoothly on their clean-cut threads after years of weather exposure. Wide, smooth contact surfaces insure high current carrying capacity and eliminate slippage. Ask your L-M representative about the complete line of L-M Connectors.

**LINE MATERIAL CO.**


as it is connected to the test terminals. An extra terminal is provided for use in measurements requiring external guarding. High potential terminal assembly is guarded so that any leakage over surface of terminal insulation will not affect calibration.

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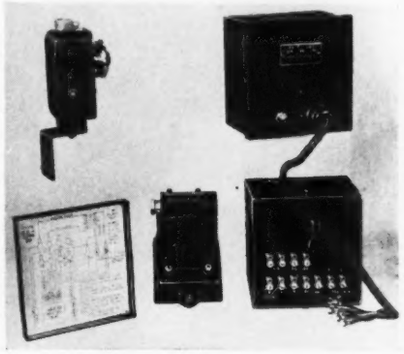
## Photo-Electric Equipment

Photo-electric counting equipment capable of 600 counts per minute or 36,000 counts per hour has been announced. Equipment includes photo-electric amplifier and contact relay unit, light source with



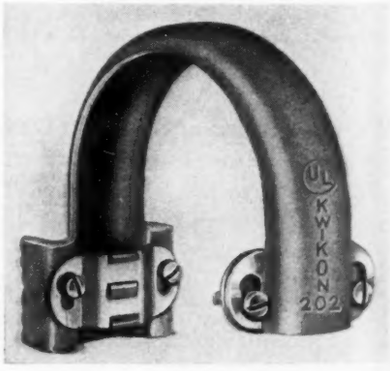
Type "PC-3" photo-electric counting equipment; control cabinet designed to operate on 110-volt, 60-cycle mains, draws 30 watts. **Lipman Engineering Co.,** 415 Van Braam St., Pittsburgh, Pa.

adjustable bracket, power supply control box and counter, in four- or six-digit models. Polarized plugs are used for connections and permit service or replacement.

•

## Service Cable Head

This service entrance cable head terminates the cable end in a fixed downward position, thus preventing the entrance of moisture and rain through the cable to both the meter and testing equipment, with subsequent damage and expense.



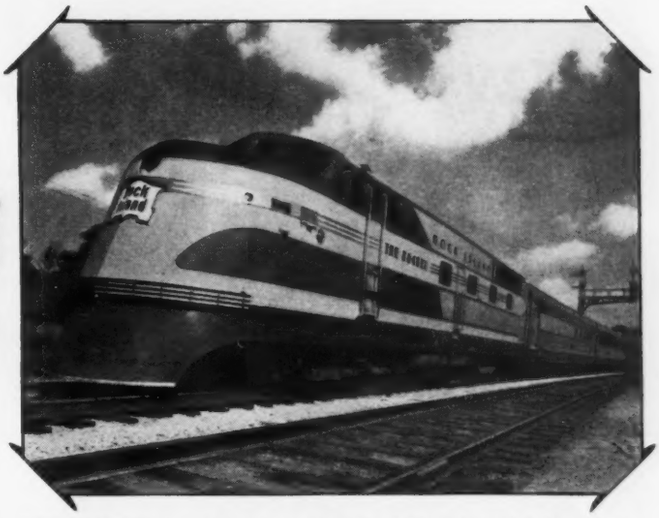

"No. 202" service cable head. **Kwikon Co.,** Chicago, Ill.

•

## Fluorescent Fixtures

Hygrade Sylvania Corp., Salem, Mass., recently announced the addition to its line of the new 40-watt, T-12 fluorescent lamp, 48 in. long, 1½ in. in diameter and supplying 35 lumens per watt. It is offered only in "daylight" and "warm white" shades. To accommodate the longer fluorescent lamps, the Fostoria Pressed Steel Corporation, Fostoria, Ohio, has added fluorescent canopy units, chiefly for industrial use, in overhead, bench and

# WHICH PICTURE ARE YOU IN?



**RAILROAD?** Then surely you know about Gould Batteries and their reputation for unfailing service in every kind of railroad application. Some 55 railroads in the United States depend on them for such duties as operating signals, interlocking, car retarding, lighting and air-conditioning.

**UTILITY?** You, too, are well aware of Gould. It's the battery used by more than 70 important utility companies to supply unfailing energy for the operation of circuit breakers, relays, indicators and emergency lighting.

**INDUSTRIAL?** You probably know that Gould Kathanodes keep countless industrial trucks gainfully employed . . . but do you know why in motive power service this famous battery outpulls batteries of ordinary construction?

**TELEPHONE?** Every telephone man knows that smooth, uninterrupted service depends on an unfailing source of steady, direct current. And most of you know that Gould Batteries meet these rigid requirements to the letter.

**MINING?** If you're a coal operator you're on the lookout for anything that will keep your locomotives on the job longer . . . give them plenty of reserve power for extra heavy duty. In hundreds of coal mines the answer to this problem is Gould Kathanode Batteries.

## For Over 40 Years Gould Has Made Batteries for Every Industrial Application!

**GOULD PLANTE:** *Guaranteed 14 years* in floating service. Maximum life with highest sustained capacity under all operating conditions made possible by exclusive one-piece pure lead spun plate process.

**GOULD KATHANODE:** *Guaranteed from 5 to 10 years.* Spun Glass construction provides long life, light weight and high capacity at low operating cost. For all motive power and railroad applications.

**GOULD DREADNAUGHT** *Guaranteed from 2 to 8 years.* Maximum capacity and long life when pasted plate construction for low initial cost is of primary importance.

**NOTE:** KATHANODE and DREADNAUGHT batteries are available in either Glass Jar or Hard Rubber construction.

**FREE** illustrated manuals describing any of these exclusive Gould constructions are yours upon request. Write: Gould Storage Battery Corporation, Depew, N. Y.

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WE WANT MORE

REVENUE!

THE FACE OF EVERY TOP UTILITY EXECUTIVE FITS THIS PICTURE, SO . . .*

*You can GET that EXTRA REVENUE you want by getting behind the big national advertising and promotional drive on

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| 1 ELECTRIC ROASTERS move low-use customers over onto the PROFIT side. | 2 ELECTRIC ROASTERS use current at HIGH blocks in rate structure. | 3 ELECTRIC ROASTERS rank FOURTH as load-builders among all home appliances. |
| 4 ELECTRIC ROASTERS require NOT ONE CENT of added capital investment for utility. | 5 ELECTRIC ROASTERS already rank FIFTH among appliances retailing for $20 or more. | THREE YEAR $ ELECTRIC ROA$TER advertising drive sponsored by EVERHOT... PROCTOR... GENERAL ELECTRIC . . . NESCO... WESTINGHOUSE |

WRITE NOW FOR ELECTRIC ROASTER PLAN BOOK

THE MODERN KITCHEN BUREAU
420 Lexington Ave... New York, N. Y.


table models. Miller Company, Meriden, Conn., has added both flood and concentrating three-light fluorescent units for localized industrial application to its line, which includes models for the new 48-in. tubes. For desk or counter use, both Mitchell Manufacturing Company, Chicago, Ill., and Artistic Lamp Manufacturing Company, 395 Fourth Ave., New York, N. Y., have brought out models taking one 15-watt, T-8 fluorescent lamp.

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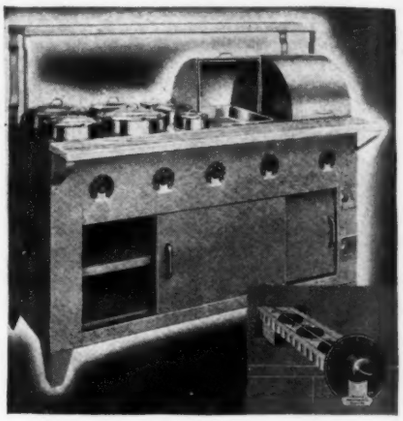
## Cooking Appliances

Removable Nichrome bar-heating units are used in a new line of electrically heated, thermostatically controlled hot-food storage and serving equipment.



"Thermolator" cooking equipment, removable heating element in insert. **Ershler & Krukin, Inc.**, Bayonne, N. J.

Separate thermostatic dial controls on the front panel of each heating unit permit adjustments without disturbing the hot food insets. The line ranges in capacity from single inset back-bar portable units to complete serving tables.

•

## Textile Equipment

"De-ion" motor starter; "Lint-Free" spinning frame motor. Department 7-N-20; **Westinghouse Electric & Mfg. Co.**, East Pittsburgh, Pa.

New electrical equipment for the textile industry, as announced by this company, includes a "de-ion" motor starter and a "Lint-Free" spinning frame motor. The motor starter uses a toggle-type switching mechanism which is held under normal conditions by a latching device. On sustained overload in the motor circuit, the snap action of a bi-metallic disk releases the latch and opens the switch. Features of the new motor include: Specially-shaped rotor vanes which circulate air through the motor to remove lint; glass-smooth winding to prevent lint from clinging; extra-large air passages and absence of screens.

•

## Portable Electric Hammer

"No. 36" portable electric hammer; develops 1,950 blows per minute, capacity in concrete or brick of 2 in. **Black & Decker Mfg. Co.**, Towson, Md.

In redesigning its largest portable electric hammer, this company changed the operating principle; blow action is now developed by a piston driven by a crank through a connecting rod, the recoil of the piston being absorbed by a spring and air cushion. Universal motor, mounted at right angles to piston cylinder, operates crank through train of reducing gears.

# Get your repair crews on the job fast! ... by RADIO TELEPHONE

RADIO telephone puts your office in almost instant communication with your truck crews. In emergencies, it's the surest way to save time that may save lives. Day in, day out it helps you to render better service to your customers — an important point from your public relations angle.

### Backed by years of experience

There's nothing untried about the equipment that Western Electric offers you. It's similar to Western Electric Police Radio apparatus which is giving added protection to 45,000,000 people. It has proved its 24-hour-a-day reliability through years of service in localities from coast to coast.

### Designed by Bell Telephone Laboratories

Transmitting and receiving equipments for installation at headquarters are compact and simple to operate. So are the rugged transmitters and receivers specially designed for use in cars and trucks. Engineered by Bell Telephone Laboratories and made by the maker of Bell telephones, you can be sure that Western Electric equipment more than meets all the F.C.C. requirements.

### Get further details

There can be no question that radio telephone soon will be used widely by light and power companies. For full information on equipment to help you give better, faster service, send the coupon to Graybar.

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**Western Electric**
**RADIO TELEPHONE EQUIPMENT**

GRAYBAR ELECTRIC COMPANY
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Please send information on Western Electric Radio Telephone equipment for use by light and power companies.

*Name*.....

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*City*..... *State*.....

# NEWS ABOUT PEOPLE

## West and Thuerk Assigned New Duties by Associated

Announcement has been made by R. D. Jennison, president of the Utility Management Corp., mutually-owned management organization for the Associated Gas & Electric System, of the appointment of L. D. West, vice-president, as supervisory vice-president for a group of operating companies in the System. For some time Mr. West has been in supervisory charge of sales and new business activities for the system.

H. C. Thuerk, formerly assistant to the vice-president in charge of sales, has succeeded Mr. West in this work, becoming general manager of sales for the Utility Management Corp.

A graduate of Cornell University, Mr. West was for several years associated with the Cleveland Electric Illuminating Co., and in 1915 joined the United Electric Light & Power Co.,

L. D. West

Waterbury, Conn. In 1917 he became superintendent of the underground department of the Metropolitan Edison Co., Reading, Pa., and one year later he was made assistant general manager of the company. Subsequently he assumed executive direction of the new business department of this company and other companies in the General Gas & Electric System. In 1929 he was made vice-president in charge of sales of the Utility Management Corp.

*Chidnoff*

H. C. Thuerk

Mr. Thuerk became commercial manager of the Olean district of Niagara, Lockport and Ontario Power Co. after graduation from Purdue University. In 1922 he became commercial manager of the Ridgway, Pa., division of the West Penn Power Co., and in 1924 he joined Erie Lighting Co. After serving in the capacity of manager he joined the Utility Management Corp. as manager of industrial sales. He was made assistant to the vice-president in charge of sales in 1932. Mr. Thuerk is also a vice-president and director of the Metropolitan Edison Co., Reading, Pa.

•

▶ WILLIAM F. SIMS, chief electrical engineer, Commonwealth Edison Co., Chicago, was elected a director of the Electric Association of Chicago at the regular meeting of the board, to represent the utilities group for the unexpired term of 1939-40.

## Calvin T. Hughes Assumes New Duties in Connecticut

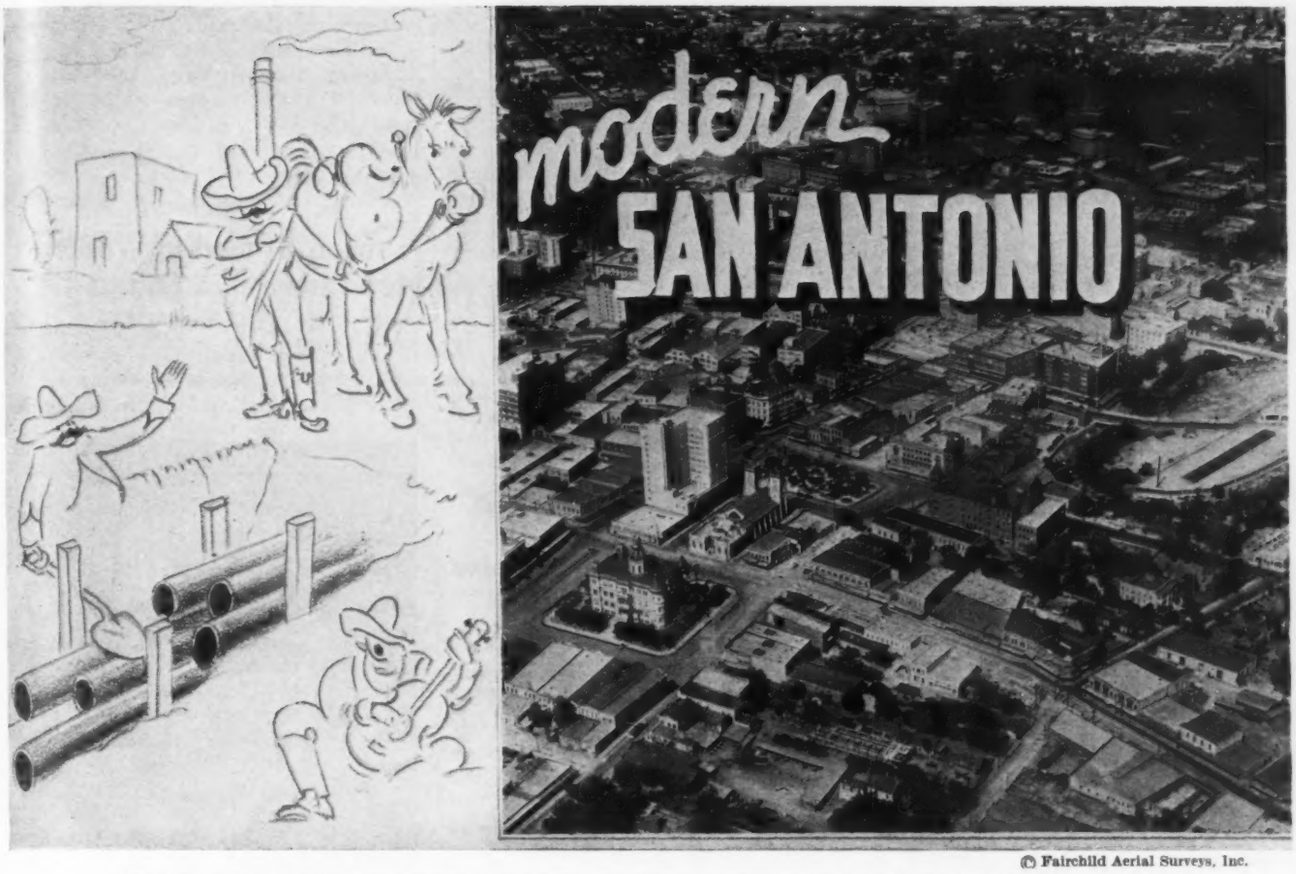
Calvin T. Hughes, who was recently appointed general operating superintendent of the Connecticut Light & Power Co., Hartford, joined the company 21 years ago following the World War. He has supervised construction in many parts of the company's system. Before his recent promotion he was serving in the capacity of electrical engineer. Mr. Hughes is a graduate of Oklahoma University and a member of the A.I.E.E.

ROBERT P. STACY, promoted to executive assistant, became associated with the Connecticut utility in 1929 and has filled several administrative positions in the company, among them manager of the Rockville-Willimantic Lighting Co., a subsidiary. He formerly served in executive and operating capacities with utility companies in West Virginia, Pennsylvania and New York,

and early in his career was identified with the Westinghouse Electric & Manufacturing Co.

WILLIAM T. JEBB, who was advanced to manager of the company's Waterbury division from the position of assistant superintendent of the company, has been connected with the company

# ORANGEBURG HAS *long* BEEN PART OF

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**The City of the Alamo—San Antonio, Texas—City of tomorrow under the colorful dress of picturesque and historical landmarks—its underground distribution system is a modern layout built for continuity of service.**

**CABLE PROTECTION**

Orangeburg is chemically inert. The cables are protected from alkaline contact or acid corrosion when installed underground. It is impermeable to ground water and watertight at joints.

One of the many Orangeburg "points that count."

Orangeburg, trademark, is a guarantee of the best of Fibre Conduits, a time-tested enduring "service" of cable protection *wherever electrical raceway facilities are to be installed* underground.

● The test supreme . . . the test of time in actual experience . . . has proved that Orangeburg gives permanent cable protection. At many points, installations made 40 and more years ago are still providing clear, usable raceway. 30-year installations are common.

Since 1893, Orangeburg has been a standard of quality in underground construction . . . a leadership maintained by constant research for product and service betterment. Recent improvements add materially to the trouble-free expectancy from Orangeburg installations for cable protection.

For installation underground WITH CONCRETE ENCASEMENTS: Orangeburg STANDARD FIBRE CONDUIT is recommended for duct banks (4 ducts and over), main distribution, high tension and "down town" locations.

For Installation WITHOUT CONTRETE ENCASEMENTS, the Orangeburg dual-economy NOCRETE conduit is recommended for service entrances, extensions, parkways and street lighting, suburban distribution, laterals, signal systems, etc.

*Sales Agent—Distributors*

**GRAYBAR ELECTRIC COMPANY INC.**

**GENERAL ELECTRIC SUPPLY CORP.**

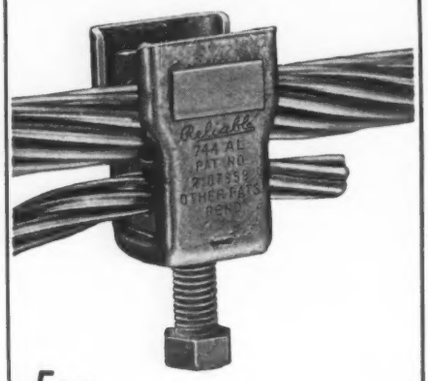
**MADE AT ORANGEBURG, NEW YORK**
**BY THE FIBRE CONDUIT COMPANY**
**292 MADISON AVE., NEW YORK CITY**

**ORANGEBURG** **Standard for installation *with* concrete encasement**
**Nocrete for installation *without* concrete encasement**

Specify

Reliable

TAP CLAMPS

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**Tap connections to aluminum over armor rods.**

**Aluminum to Aluminum**
**Aluminum to Guy Wire**
**Aluminum to Copper**

★ Convenient to install

★ Copper and aluminum are well separated

★ Aluminum parts of clamp contact armor rods

★ Copper surfaces contact the copper tap wire

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Reliable
ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE · CHICAGO, ILLINOIS

since 1928, when he joined the organization as engineer in charge of gas operations.

•

## Abercrombie New President Western Mass. Companies

Fred C. Abercrombie was elected president of the Western Massachusetts Companies, Greenfield, at a meeting of the trustees in Boston on April 12. He succeeds George W. Lawrence, who resigned on account of poor health after many years' service. W. Rodman Peabody, Boston, vice-president, was elected chairman of the board, and Joseph F. Lyons of Springfield, former comptroller, was elected treasurer to succeed Mr. Abercrombie. The new president was also secretary, and that post will be filled by Robert S. Ingram, Boston. Linwood E. Hewitt of Turners Falls becomes comptroller.

•

## TVA Management Promotes Construction Engineers

Promotion and transfer of six TVA engineers as a result of expanded construction activity at Gilbertsville Dam and initial work on the Watts Bar project has been announced by John B. Blandford, Jr., general manager of the authority.

Lee G. Warren, project engineer at Chickamauga Dam, now becomes project manager of both the Chickamauga and Watts Bar projects. Eugene A. Prokop, acting construction engineer on the Gilbertsville project, has been appointed reservoir construction engineer. He will assist in exercising engineering supervision over all construction work in the area except that connected directly with the dam and appurtenant structures.

Benjamin S. Philbrick is being transferred from construction superintendent at Guntersville Dam to construction superintendent at Gilbertsville. James B. Hays, now serving as construction engineer at Chickamauga Dam, becomes construction engineer of the Gilbertsville project. He is being replaced at Chickamauga by Joseph K. Black, present assistant construction engineer of the Chickamauga project. Frank W. Webster, principal highway engineer in the engineering design department, becomes head highway engineer.

•

▶ JAMES M. HUEBNER, formerly manager of the Bethlehem division of the Pennsylvania Power & Light Co., has been transferred to the position of division manager of the Lancaster division. JAMES C. KNOWLES, formerly manager of the Susquehanna division with headquarters at Sunbury, has been transferred to the position with the Bethlehem division. MERLE S. LAWRENCE formerly commercial manager of the Susquehanna division, has been promoted to the position of manager of the Susquehanna division and A. A. ANDERSON, formerly chief power salesman of the Susquehanna division, has been appointed to the position of commercial manager of the Susquehanna division.

•

## Johnson Named to Works Managership in England

Sangamo Electric Co., Springfield, Ill., has announced the appointment of L. Dana Johnson as works manager of its factory in England. Mr. Johnson

has been associated with Sangamo for the past 25 years, eight of which he resided in Japan as manager of the company's interests in the Far East.

Since his return from Japan in 1928 Mr. Johnson has been active as assistant general sales manager. He will sail in the early part of May.

•

▶ PERCY S. YOUNG, vice-president of the Public Service Electric & Gas Co. of New Jersey, was elected recently a director of the American Gas Association. He has been president of the association and an active worker on many of its committees.

▶ JOHN SARGENT of the Menominee & Marinette Light & Traction Co., has been named by Mayor R. P. Murray of Marinette, Wis., to represent utilities on a committee organized to formulate plans to expand and promote industrial and civic interests in Marinette.

▶ WILLIAM H. HODGE, advertising and sales consultant of Chicago, has been appointed associate publisher of *Public Service Magazine*, founded by the late Harvey J. Gonden. Mr. Hodge will have charge of the editorial policy,

circulation and advertising and will maintain a Chicago office in the Civic Opera Building, the principal office being in St. Paul, Minn. The magazine is now solely owned by Mrs. Gonden, who will continue as publisher.

▶ W. H. TAUBERT, for the past eight years sales manager of the insulation division, Corning Glass Works, Corning, N. Y., has joined the Phelps Dodge Copper Products Corp. in its sales department at New York.

▶ CHARLES P. CULBERT has been appointed general sales manager of the Proctor Electric Co., Philadelphia. Mr. Culbert has to his credit sixteen years of sales executive experience.

▶ C. Q. HOWELL, superintendent of the Leland, Miss., municipal water and power plant, has resigned to accept a position in Memphis, Tenn., after May 1.

▶ P. S. GREGORY, assistant general manager of the Shawinigan Water & Power Co., has been elected a director of Quebec Power Co., filling the vacancy created by the death of Hon. J. P. B. Casgrain.

▶ J. E. M. MITCHELL has been appointed assistant sales manager of Porcelain Products, Inc., Parkersburg, W. Va. Mr. Mitchell has for many years been associated with the Jeffery-Dewitt Insulator Co. as sales manager. In his new connection he will work with the various Porcelain Products' representatives in their respective territories, covering the entire country at regular intervals.

## OBITUARY

▶ ALBERT J. FRANK, 43, sales promotion manager of the Warren Telechron Co., Ashland, Mass., died suddenly March 19 at his home in Framingham Center, Mass. He joined the Telechron Co. in 1919.

▶ HARVEY J. GONDEN, editor and publisher of *Public Service Magazine*, died March 21 in Minneapolis, Minn. *Public Service Magazine* was founded by Mr. Gonden in 1906.

▶ ALBERT L. MACEACHERN, for the past fifteen years superintendent of the meter department of the Brockton Edison Company, Brockton, Mass., died at his home in that city on April 5. He was born in Brockton 46 years ago and had been in the company's employ for 30 years.

▶ J. S. MACKENZIE, treasurer of the Winnipeg Electric Co., Winnipeg, Canada, died February 28. For a number of years Mr. Mackenzie had been associated with the Winnipeg properties as purchasing agent, assistant treasurer and more recently as treasurer.

**More Than**

**800 YEARS**

**Making Insulators**

These "Old-timers"* rate the title "Expert Master Craftsmen." Every one of them has been making insulators for more than 20 years,—*right here in Victor.*

This unusual experience is essential to the production of perfect insulators.

Every piece of Victor porcelain is produced with this hard-earned knowledge and skill embodied in it. When you buy Victor, you get Good Insulators that give you lasting, economical and safe performance.

***Note:* Illustration from an authentic photograph made in our plant.

V *The Mark of a* **GOOD** *Insulator*

**VICTOR INSULATORS, INC.**

**VICTOR, NEW YORK**

# MANUFACTURING - MARKETS

## Norwich Orders New Generating Equipment

Orders have just been placed by the Norwich, Conn., municipal lighting department with the Riley Stoker Corp. for a complete boiler unit with a capacity of 75,000 lb. per hour in continuous steam delivery, a peak capacity of 100,000 lb. per hour and an average efficiency between half and full load of 88 per cent. The unit includes water walls, air preheater, stub stack, fans, controls and insulated setting, with fuel oil burner equipment.

An order has also been placed with the General Electric Co. for a 9,735-kva. steam turbo-generator to operate at 650 lb. steam pressure, with 750 deg. F. temperature, and running at 3,600 r.p.m., energy to be delivered to the bus at 4,600 volts three-phase.

A Westinghouse condenser will be installed and the new unit will bring the capacity of the plant to approximately 20,000 kva. Arthur L. Nelson Engineers, Boston, are consultants. The new equipment is to be in operation in about six months.

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## Supply Contracts to G.E.

During the first week in April the General Electric Co. was awarded by the Department of the Interior a contract, amounting to $376,350, for power transformers. Recently the company received a contract from the Navy for motor-generators, $17,938.

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## Uptegraff Plant Expands

The new location secured by R. E. Uptegraff Manufacturing Co. at Scottdale, Pa., replaces with still greater capacity the plant recently destroyed by fire on Lexington Avenue, Pittsburgh. The plant and offices, formerly the mills occupied by Carnegie-Illinois Steel Co., have been completely remodeled and new power installed. The work of rehabilitation has been pushed to provide production at the earliest possible date for an accumulated backlog of orders for Uptegraff transformers and the new complete plant will be in full operation this month.

•

## Leonard Reports Advance in Refrigerator Sales

Continued increases in sales of Leonard electric refrigerators were reflected in March shipments from the factory, which were 386 per cent greater than those of the same month in 1938, Ray Legg, general sales manager of the Leonard refrigerator organization, announced. March shipments totaled 4,681 units, as compared with 1,305 for the same month a year ago, a unit gain of 3,376.

Mr. Legg reiterated his belief, expressed at the start of the year, that the electric refrigerator business would enjoy material gains in 1939. "Our early estimates of the situation are being borne out by the larger orders we are receiving from the field," he said. "There is an excellent feeling, all around."

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## Charging Standards

A new set of specifications covering battery-charging equipment has been adopted by the Industrial Truck Statistical Association, Chicago, comprised of manufacturers of electric industrial trucks, batteries and battery-charging equipment.

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## Sponsors Contest

Mueller Electric Co., Cleveland, is sponsoring a prize contest in co-operation with the radio, automotive and electrical jobbers on "Tricks with Mueller Clips." There will be fifteen prizes, with $25 as first prize.

## Orders Rise Shown by Westinghouse

Orders received by Westinghouse Electric & Manufacturing Co. during the quarter ended March 31 totaled $50,120,832, as against $37,998,569 in the like 1938 period, an increase of 32 per cent, A. W. Robertson, chairman, told stockholders at the annual meeting last week. Mr. Robertson stated that the management expects the improvement to continue through the year.

Bookings for the first quarter, it was pointed out by Mr. Robertson, were larger than for any three-month period since the second quarter of 1937, when the total was $67,966,891.

***Division of Net***

Mr. Robertson stated that studies showed that half the company's income was required to buy materials and supplies and to meet depreciation and taxes.

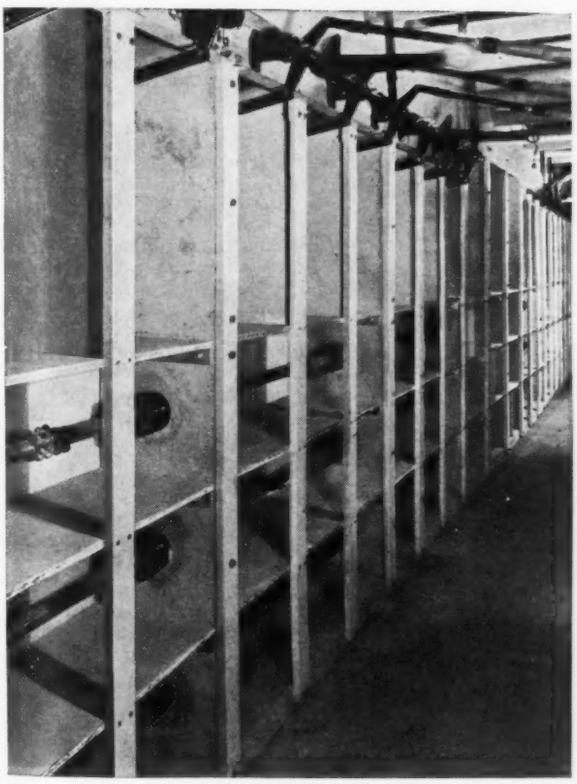
"Of the remainder," he said, "90 per cent goes to empoyees or the cost of employment in the form of wages, annuities and social security taxes; about 2 per cent is set aside for surplus and 8 per cent (less than 5 per cent of total income) is paid to stockholders.

Last Monday a figurative round-table discussion of the company's business between the management and more than 40,000 employees was held. It was revealed that employees have received a total of $19,082,353 in addition to their regular pay since May, 1936. The monthly average extra compensation, since inception of the wage and salary adjustment plan, has been 9.6 per cent.

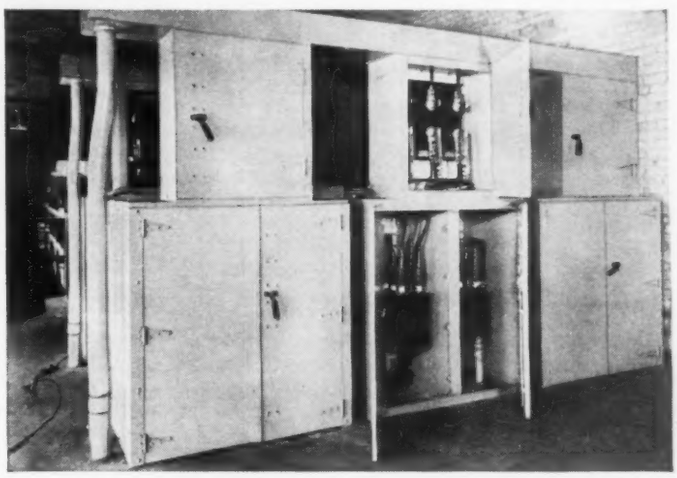
During 1938 employees received $70,459,766 in wages and salaries, an average of $1,662. Stockholders received $6,757,994 in dividends, an amount equal to $159 for each employee. Social security taxes during the year totaled $2,708,933 and taxes, exclusive of social security, totaled $4,386,854.

# BETTER EQUIPMENT HOUSINGS *Built at LOWER COST*

ON every type of distribution system, J-M Trancell Materials are reducing cell-structure costs—and at the same time making installation of equipment faster, easier, more economical. The explanation is simple. Basically asbestos, these materials are supplied in large, light, easily worked sheets. Construction can be accomplished rapidly with ordinary tools. Yet Trancell Materials are tough and durable . . . will safely withstand severe abuse. Completely fireproof, they form excellent fire barriers. And they are furnished in a wide variety of types and combinations to meet every requirement of high-voltage service. You should have full details. Write for Data Sheet DS 426 to Johns-Manville, 22 East 40th Street, New York, N. Y.



**COMPLETELY FIREPROOF,** because of their mineral, basically asbestos composition, J-M Trancell Materials add extra safety to cell structures . . . provide excellent fire barriers. Severe abuse has practically no effect on these durable housings.



**TOUGH AND DURABLE,** J-M Trancell Materials are used to provide low-cost, permanent housings for all types of electrical equipment. Made of asbestos fiber with an inorganic binder, they are supplied with or without asbestos facings. They are strong, light in weight, easy to handle and work . . . make substantial reductions in installation costs.

JM Johns-Manville

# ELECTRICAL PRODUCTS

***FOR EVERY TYPE OF DISTRIBUTION SYSTEM***

## Manufacturers Name New Representatives

Electrical manufacturing companies have recently appointed the following sales representatives:

Paragon Electric Co., Chicago, has appointed Herske and Timmis, Inc., New York, to cover metropolitan New York, northern New Jersey and eastern New York State; C. T. Moore, Kansas City, Mo., to cover western Missouri, Kansas and Oklahoma, and Conrad R. Bangh, Omaha, Neb., to cover Nebraska, South Dakota and western Iowa.

Stearns Magnetic Mfg. Co. of Milwaukee has appointed Vernon Whiting of Dallas, Tex., sales representative for the northern section of Texas.

Lincoln Electric Co., Cleveland, Ohio, announces the opening of a new office in Duluth, Minn. I. R. Bartter, formerly with the Minneapolis office of the company, will be in charge of the new branch.

•

## Heavy Unit Sales Up 20%

Sales of the heavier refrigeration units manufactured by the Frigidaire division of General Motors Corp. are running about 20 per cent ahead of 1938 in five Middle Western States, it was learned at a recent sales convention for distributors and dealers in Chicago. The territory covers Chicago and parts of Iowa, Michigan, Wisconsin and Illinois.

•

## Delta-Star Gets Contract

Los Angeles (Calif.) Department of Water & Power has awarded the Delta-Star Electric Co., Chicago, a contract approximating $95,000 for 287,000-volt, three-pole disconnecting switches for use on the new transmission line from Boulder Dam to Los Angeles. These switches, for installation at Silver Lake and Victorville, are duplicates of those installed in 1934 for the original lines.

•

## Plan to Start New Unit

Construction will start before May 1 on a large addition to the plant of Hygrade Sylvania Corp., at Emporium, Pa. The new unit, to be of brick, steel and concrete construction, will comprise 50,000 sq.ft. of floor space and is scheduled to be ready for occupancy about October 1.

### New York Metal Prices

| | Apr. 18, 1939 Cents per Pound | Apr. 12, 1939 Cents per Pound |
|---|---|---|
| Copper electrolytic | 10.50* | 10.75* |
| Lead Am. S. & R. price | 4.75 | 4.75 |
| Antimony | 11.50 | 11.50 |
| Nickel ingot | 35.00 | 35.00 |
| Zinc spots | 4.89 | 4.89 |
| Tin straits | 46.875 | 46.10 |
| Aluminum, 99 per cent | 20.00 | 20.00 |

* Delivered Connecticut Valley.

# Field Reports on Business

*In spite of the European war scares, the coal strike and unsettlement in the financial markets, business continues to show gains in many quarters. Electrical manufacturers report higher earnings and larger bookings for the first quarter. Utilities are planning further expansion if present trend holds.*

### NEW ENGLAND

The outstanding feature in the electrical market in this area is the rapidly increasing volume of inquiries for electrical equipment destined for widely varying purposes. Sales continue at an encouraging rate. Recently about $6,400 worth of small motors was purchased by a western Massachusetts plant; a Connecticut brass company has bought a group of small motors at a cost of about $3,500. Central station supplies are moving; a 4,500-kva. transformer was recently ordered by a Vermont utility; a 5½-mile, 13-kv. transmission line extension to serve Wendell, Orange and Erving, Mass., will be built soon by New England Power Co.

Two new electro-magnetic cranes will be bought for the Army Base Terminal, South Boston. These cranes have a capacity of 350 tons each and cost $90,000. Collyer Insulated Wire Co., Pawtucket, R. I., has received a $29,525 contract from the U. S. Navy. Special machine tool equipment is moving for shipyard service with electric motor drives.

Outdoor electric signs are attracting interest. Activity in street lighting is reported from Rhode Island, where surveys have been scheduled for Bristol, Warren and Barrington. More than 1,500 fluorescent units have been sold by General Electric Co. to one Massachusetts manufacturer. The Hygrade Sylvania Corp. plans a 50,000-sq. ft. addition to its Emporium, Pa., plant. The Donnelly Neon Sign Co. recently completed the installation of one of the largest signs in this area. Approximately 78x77 ft., this sign required 3,752 ft. of Neon tubing, 146 transformers and carries an energy load of 23.3 kw. for lamps and 31.4 kw. for the Neon tubes.

One prominent appliance sales manager reports more than 50 per cent increase in sales for the first quarter as compared with last year. Strongest trends in major appliances are noted for laundering equipment. The fuel shortage due to the truck strike in eastern Massachusetts has opened up the market for electric air heaters.

### PACIFIC COAST

Shipping and lumber business revival have helped the Pacific Northwest and the Portland area has especially benefited through buying for Bonneville plant and power lines. Recent awards for its various substations include $15,390 for G. E. circuit breakers, $19,125 for Westinghouse switchgear equipment, $50,823 to Bethlehem for steel superstructure, $33,891 to Wagner for three 4,000-kva. transformers, and $27,840 for 125-ton electric crane. Westinghouse was low bidder at $308,770 for seven 20,000-kva. transformers for Bonneville and Harnischfeger Corp. was low at $498,932 for 37 electric cranes for various Pacific Coast shipyards. Coast yards are hopeful of securing a good share of four each destroyers and submarines, to be awarded about May 25. Other industrial hopes are based upon prospective need of Shasta Dam for 6,000,000 barrels of cement and a 3,000-hp. gravel plant is being built near Redding.

A typical recent week added an 1,100-hp. load to mines in the Mother Lode area of central California. Three steam-power generating plants, costing $15,000,000, are under construction by Pacific Gas & Electric Co. to serve three major oil company refineries in upper San Francisco Bay area, the Shell and Associated plants at Martinez and Avon, respectively, to be completed this year and the Union Oil plant at Oleum in 1940. The oil companies purchase steam and power and partially pay with oil and by-products for fuel.

### NEW YORK

There has been a noticable slowing down of business as a result of the coal strike. Carloadings have slipped lower and purchasing power has been reduced by forced unemployment. Retail trade in this area has held up fairly well, with some good response in after Easter buying.

Opening of the New York fair is expected to lift the level of trade. The fair is scheduled to open on time—April 30—and work is being speeded to the extent that weekly payrolls total more than $900,000. The utility industry has a splendid exhibit, in addition to the fine one of Consolidated Edison. The electrified farm is sure to attract attention.

Electrical manufacturers report a sharp increase in orders during the first quarter with earnings on the uptrend. A better feeling among the manufacturers exists. Opinion is that activity will show a further rise during the year. A great deal of utility construction is being planned and some is expected to be released in the near future.

### CHICAGO

Reports on results of the first quarter's business from firms in this area are predominantly favorable. On the whole, business showed substantial improvement over the first quarter of last year, with an average gain of approximately 18 per cent. Residential building was one of the brightest spots in the picture, running close to 50 per cent above a year ago. Sales of electrical equipment were particularly encouraging, registering gains of from 15 to 25 per cent on an average. Wholesale and retail trade increased about 10 per cent.

However, the past two weeks has found a mixed condition, with a tone of caution prevailing. Curtailed forward buying as a result of the uncertain outlook over the near future was reflected. Electrical energy output fell off rather sharply and steel production declined several points. Retail trade slumped again after the Easter peak and wholesalers report more hesitancy in future commitments.

Additional REA allotments made in six Illinois counties total $606,000 for 624 miles of line. Improvements and extensions to three nearby municipal power plants will cost $189,000. Lighting equipment sales are holding up well, with fluorescent lamps very much in demand. Air-conditioning apparatus is moving at a faster pace and range installations are going ahead slowly.

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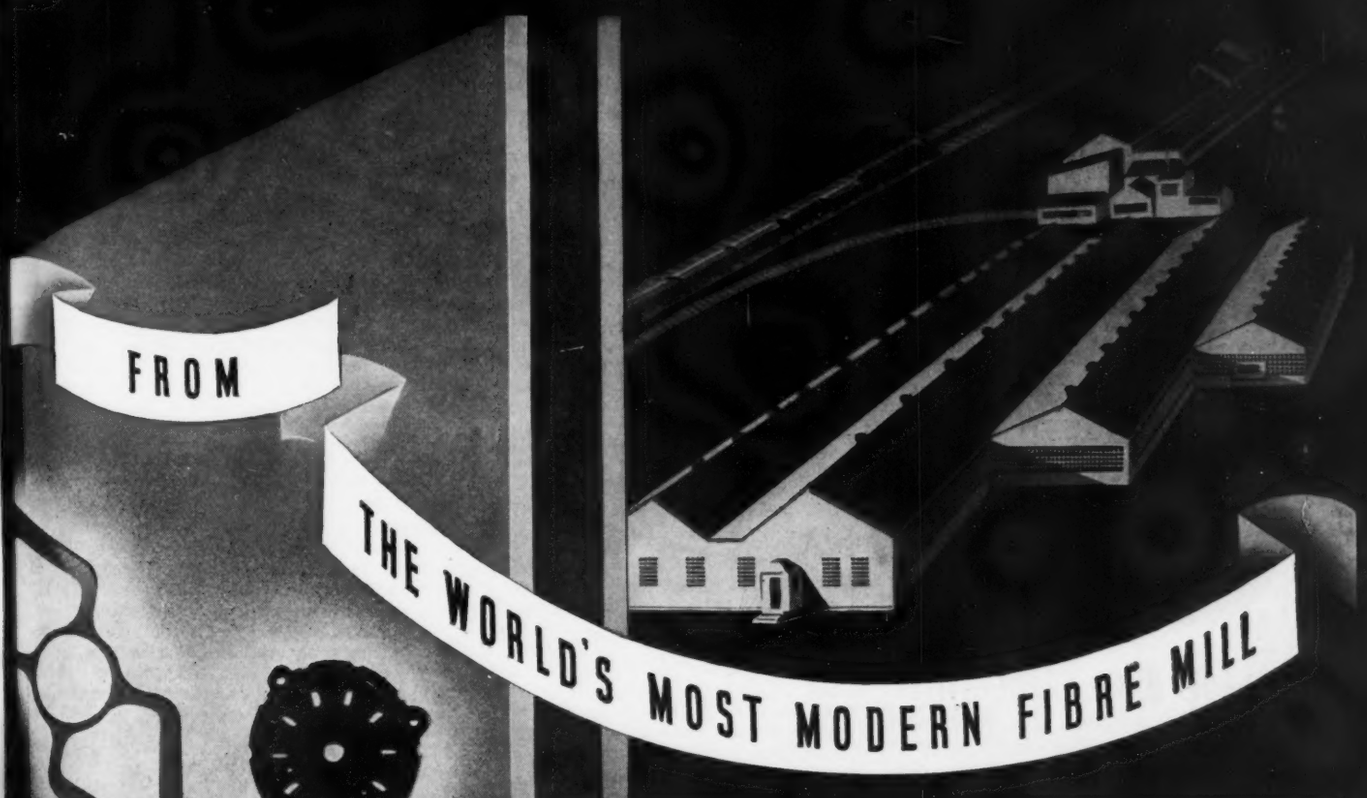


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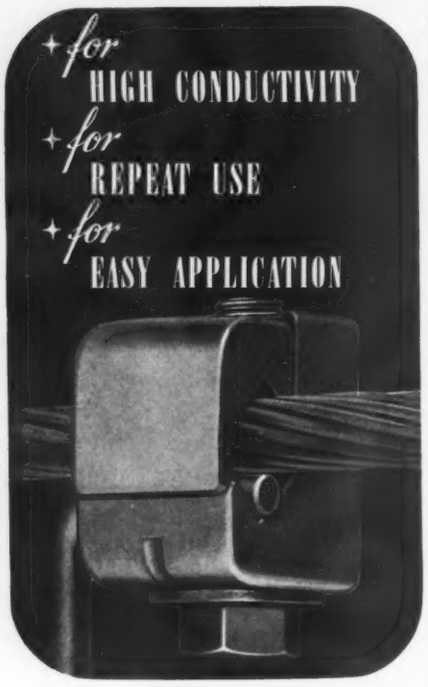


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## Municipal Plants

TAMPA, FLA.—Pat Whitaker, state Sentor, has advertised two local bills he will introduce in the 1939 Florida Legislature which would require the city to build an electric plant for municipal use and would call a referendum in September on whether the city should have a municipally owned electric plant to serve individual consumers. The two bills advertised made a total of eight so far directed by the Senator toward municipal electric plant ownership and operation. His other measures, already advertised, would among other things, terminate the Tampa franchise of the Tampa Electric Co., create a utility board of five members to fix electric and gas rates and empower the board to tax utilities for the use of streets. The bills were advertised in conformity with a constitutional requirement for 30 day advance notice of so-called "local bills" before they are introduced.

YORK, NEB.—Arguments were recently heard by Federal Judge Munger in the request brought by the city to fix an ouster date for power lines of the Iowa-Nebraska Light & Power Co. At a special election some time ago the municipality was authorized to construct a $475,000 municipal plant. It is contended by the city that the utility is operating without a franchise. Counsel for the city claim that the original franchise granted the original company 52 years ago was not for perpetuity, as claimed by the company, but only for 21 years. William Fenton, of the Iowa-Nebraska Light & Power Co., testified that the utility's capital expenditures in York will run approximately, over the period of years of operation, close to $780,000. The judge took the case under advisement.

COLUMBUS, NEB.—The state Supreme Court held null and void the special election held by the city in 1936 to pass on the question of purchase of the existing lighting and power properties of the Northwestern Public Service Co. on the ground that the petition and the ballot stated questions of fact which were unfounded, and that the form in which the question was presented made it impossible for a voter to cast an intelligent ballot.

MINATARE, NEB.—P. B. Goff, citizen, has filed suit in district court to stop construction of a municipal electric distribution system by the town. He asked the court to declare unconstitutional the bill passed in 1935 enabling municipalities to own power systems, to declare null and void $41,000 in bonds issued by the city to finance the system, to order the state auditor to revoke registration of the bonds and order their cancellation, and to enjoin city officials from construction work. H. R. McElwee, president of city council, asserted the suit was "another step taken by the Western Public Service Co. to delay construction of our light system." Western Public Service now serves the town.

CLEVELAND, OHIO—All legal barriers to the expansion of the electric light plant were removed recently when the Ohio Supreme Court refused to review a taxpayer's suit to invalidate a $3,000,000 bond issue. A taxpayer had sought to invalidate a referendum in the city's ordinance providing for the bond issue.

NEWTON FALLS, OHIO—Village has won its tenth legal battle in building a municipal light and power plant, when the Ohio Supreme Court recently overruled a motion to make the Ohio Public Service Co. a party defendant in an action filed by the village against Judge Dewey B. McVicker. Village obtained a temporary writ of prohibition recently preventing the judge from hearing a suit attacking validity of the proceedings which already had been upheld in previous court atcions. Ohio Public Service Co. sought to be made a party to the action so it could help defend Judge McVicker's right to hear the pending action, but the Ohio Supreme Court refused to allow it to become a party.

EDGERTON, WIS.—Wisconsin Public Service Commission has appealed to the state Supreme Court for a rehearing on its decision in March setting aside a commission order authorizing the city to buy the electric plant of the Wisconsin Power & Light Co. for $95,000. The commission, in its application for a rehearing, said that the court's decision was not in accordance with utility acquisition laws.

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## Recent Rate Changes

INDIANAPOLIS POWER & LIGHT CO. has been authorized by the state Public Service Commission to reduce its electric light rates $200,000 annually. The new schedule will mean a reduction of 15 cents a month for the first block of 30 kw.-hr. used by city and rural customers. The commission authorized a cut of from 5½ to 5 cents per kilowatt-hour in the city and from 6 to 5½ cents in rural areas. The reduction is not effective on energy used above the first 30 kw.-hr. block. The new rate became effective April 1 and will apply on March electrical consumption.

NEW YORK STATE ELECTRIC & GAS CORP. has revised electric rates for customers in portions of Orange and Ulster counties, effecting savings of $10,900 annually. The state Public Service Commission allowed the rates to become effective April 2 in the village of Walden, town of Wallkill and portions of the towns of Montgomery, Shawangunk and Crawford. No customer of the company in this area will be increased as the result of the new rates which apply to residential, general commercial and power service.

CONCORD (N. H.) ELECTRIC CO. has announced rate reductions, aggregating $27,000 annually. The Public Service Commission has approved the new rates.

PENNSYLVANIA PUBLIC UTILITY COMMISSION has announced that the Harvey's Lake Light Co., which buys its electricity from the Luzerne County Gas & Electric Co., will file a new tariff designed to give an annual saving to its customers of approximately $8,750, effective for all billings after April 20.

ILLINOIS COMMERCE COMMISSION has announced the electric rate revisions effective during the month of March resulted in a saving of $72,849.

NEW YORK PUBLIC SERVICE COMMISSION has announced that it had permitted the Westchester Lighting Co. and the Yonkers Electric Light & Power Co. to establish reduced electric rates, effective April 1, under which consumers in Mount Vernon, New Rochelle, White Plains, Yonkers and many villages and towns in Westchester County will save $267,000 annually. The new schedules provide reduced rates for residential, religious, general commercial, residential cooking and charitable purposes. Reductions in initial and minimum charges will result, the commission announced, in a reduction in all bills rendered by the Westchester company and in most of the bills of the Yonkers company.

## Recent Legislation

Various state Legislatures have recently taken action on measures affecting the electric light and power industry:

NEBRASKA—Legislature has just killed three measures which public power district men claim caused New York financiers to withdraw their backing. The first submitted by Senator Craven provided that directors of public power districts and the holders of revenue debentures, notes or warrants should not have the power to fix maximum rates for electric energy, water or other services sold by them. The present law gives that power and requires revenues to be paid into a special fund held for benefit of holders of evidence of indebtedness. A measure which proposed that a constitutional amendment be submitted to the voters which provided for taxation of any property acquired by public power districts, heretofore or hereafter purchased, along with extensions or replacements within cities and villages on the same basis as other real and personal property was defeated. Still another measure that failed to pass would have made the area of the Loup River, Central Nebraska and Platte Valley public power districts co-extensive with the combined area of the counties in which they have lines for the transmission of electric energy.

NEW YORK—A measure has been introduced in the Legislature, amending the public service law in relation to submetering corporations. The amendment requires that the rates of these corporations be the same as private utility companies. Customers must be paid interest on deposits to secure payment of bills and upon the discontinuance of service deposits must be returned to the customers. Under the provisions of a bill introduced in the Senate paragraph 186-a Tax Law and paragraph 20-b General City Law are amended to continue emergency tax of 2 per cent on gross income or gross operating income of utility corporations and continues authority to cities to impose by local laws same tax not to exceed one per cent for financing local unemployment relief and appropriates $40,000; gross income is not to include income from education board or school district for transportation of school children. The measure has been referred to the taxation committee.

PENNSYLVANIA—Overriding the Democratic minority, House Republicans passed finally the state public utility commission "ripper bill," despite attacks on its constitutionality. The bill, which provided for removal and appointment of state public utility commissioners by a majority of the senate instead of the present two-thirds, was sent to the senate for concurrence. Power to regulate and fix the rates for service furnished by municipal corporations has been granted to the Public Utility Commission only when the service shall be beyond its corporate limits under a bill approved by Governor Arthur H. James. The bill also extends such freedom from regulation to public utility service furnished by an operating agency of any such municipal corporation. The commission would be given control of rates charged by municipal utility concerns for service outside municipal limits in competition with an existing public utility under a measure introduced in the House by Rep. Thomas B. Stockham.


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Position .....
Name of Company.....F.W. 4-22-39


# Sales Opportunities

BONNEVILLE, ORE.—Procurement Officer, Bonneville Project, Department of Interior, 811 N. E. Oregon Street, Portland, Ore., receives bids until May 1 for power substation and underground conduit lines in vicinity of Bonneville hydroelectric generating station, Bonneville.

CHICAGO, ILL.—Victor Chemical Works, 141 West Jackson Boulevard, Chicago, plans installation of motors and controls, regulators, conveyors, loaders and other equipment in connection with expansion and improvements in branch plant at Mount Pleasant, Tenn., used for production of phosphate and allied products; proposed to provide additional electric furnace capacity. Cost estimated at close to $850,000. Also for similar expansion and betterments in branch works at Chicago Heights, Ill., devoted to acid and other chemical products, to cost approximately $150,000. Company has concluded financing in amount of $1,000,000 for project, which will be carried out over a period of months.

WYMORE, NEB.—Has authorized plans for extensions and improvements in municipal electric power plant, with installation of additional equipment for increased capacity. Cost estimated close to $150,000. Proposed to ask bids at early date. E. H. Dunmire, 1802 B Street, Lincoln, Neb., is consulting engineer.

TORONTO, OHIO—Ohio Edison Company, Youngstown, Ohio, has plans maturing for proposed addition to hydro-electric generating station at Toronto, including installation of hydraulic-generator unit and auxiliary equipment for increased capacity. Contracts are expected to be awarded for different features of work at early date. Cost reported in excess of $3,000,000. This is part of 1939 expansion program of company, for which a total fund of about $4,000,000 has been authorized, to include transmission line extensions in connection with Toronto station development, as well as other transmission and distributing lines, power substations, switching stations and other work in different parts of system. Company is a unit of Commonwealth & Southern Corporation, New York.

PEARISBURG, VA.—Celanese Corporation of America, Inc., 180 Madison Avenue, New York, N. Y., plans installation of motors and controls, transformers and accessories, regulators, conveyors and other equipment in new cellulose rayon mill at Pearisburg, for which building award has been made to the Hughes-Foulkrod Company. Schaff Building, Philadelphia, Pa. It will consist of five large units. A power house will be built. Awards for equipment are scheduled to be made soon. Completion is planned early in 1940. Cost estimated close to $5,000,000.

KNOXVILLE, TENN.—Tennessee Valley Authority, Knoxville, will secure appropriation early in July for new power dam and hydroelectric generating station at Watts Bar on Tennessee River, located about eight miles from Spring City, Rhea County, Tenn., and will proceed with work shortly thereafter. Dam will be approximately 2,930 feet in length, with central concrete dam section about 1651 feet long, with navigation lock, power house and spillway. Initial station installation will comprise three 30,000-kw. generating units, giving rating of 90,000 kw., later to be increased to 150,000 kw., with addition of two more generators of like capacity. Immediate cost of project is estimated at $35,000,000, including transmission lines, power substations and switching stations and other structures. This estimate is exclusive of the last two generator units to be installed, as noted. Completion of project is scheduled for late in 1942.

PONCA CITY, OKLA.—Continental Oil Company, Ponca City, plans installation of motors and controls, compressors, pumping machinery and other equipment in new natural gasoline plant in Ville Platta oil field area, Louisiana. Plant will consist of several units and is estimated to cost about $500,000. Work will begin soon. Executive offices of company are at 60 East Forty-second Street, New York, N. Y.

CALEXICO, CALIF.—Board of Directors, Imperial Irrigation District, El Centro, for new hydroelectric generating plant at Calif., receives bids until May 2 for hydraulic gates, gate hoists and transfer cars Drop No. 4, All-American Canal, vicinity of Calexico, including three 12-foot, 8-inch by 18-foot, 3-inch, radial gates; three 16,000-pound capacity, double-drum, motor-driven radial gate hoists; three 11-foot by 12-foot, 6-inch bulkhead gates and six gate lathes; and one bulkhead-gate crane, with hand hoist and gate-connecting chains, and one bulkhead-gate crane track. M. J. Dowd is chief engineer and general superintendent.

BELLINGHAM, WASH.—Board of Trustees, Western Washington College, Bellingham, plans extensions and improvements in power plant at institution, including installation of additional equipment for increased capacity. Work will be carried out in conjunction with an expansion program at college, estimated to cost close to $300,000. Appropriation will be arranged in near future.

SIDNEY, OHIO—Prima Manufacturing Corporation, Sidney, plans installation of motors and controls, conveyors, electric hoists and other equipment in connection with proposed rebuilding of washing machine-manufacturing plant recently destroyed by fire. Loss estimated close to $350,000.

DYER, TENN.—Is considering preliminary plans for installation of a municipal electrical distributing system, with power substation and transmission line for connection with high-tension system of Tennessee Valley Authority, from which power will be secured.

AURORA, ILL.—Western-Austin Company, manufacturer of road-building machinery and parts, etc., plans installation of motors and controls, electric hoists, electric traveling cranes, loaders and other equipment in connection with expansion and improvements in plant, including two new one-story additions, 120 x 520 feet, and 150 x 251 feet, and improvements in present plant. Cost over $400,000. E. O. Sessions & Company, 120 South LaSalle Street, Chicago, Ill., are consulting engineers.

•

# Cites Utility Progress

Statewide newspaper advertising is being used by the Wisconsin Utilities Association to call the public's attention to its booklet, "Why Has Wisconsin Forged Ahead Electrically?" Sixty-eight answers are given to this question in the booklet, which is available at electric service companies in the various cities or upon writing the association headquarters in Milwaukee.

## Health Takes a Hand

[*Continued from page 54*]

ter very shortly for more drastic treatment, and that hence he may not be able to accomplish much during the next few months.

If this is true, and it comes from excellent sources, it is the worst news business has had for some time. There are lots of high government officials who agreed with Hopkins' views on encouraging business, but none who has been able to convince the President of their soundness.

Worst of all, there is no Louis Howe at his elbow to keep the President traveling down the road which he dislikes, but which may be necessary to the carrying on of his policies after January, 1941.

•

## New Demand Meter Firm Opens Plant at Ithaca

Therm-Electric Meters Co., incorporated last year, has established a plant at Ithaca, N. Y., and is now producing a new design of thermal demand meter on the Lincoln principle. Paul M. Lincoln is president.

At present three types of demand meters are being built—the watt-demand meter in either 15- or 30-minute time periods; the ampere-demand meter, and the shunt ampere-demand meter, which operates from a 75-millivolt shunt. These use the standard type "A" terminal block. Socket and graphic type meters will be available in the very near future. Production capacity is 20,000 meters per year.

•

## Power Line Contract Let

A $349,491 contract for construction of a twin transmission circuit between Bonneville Dam and Vancouver has been signed by Fritz Ziebarth of Los Angeles, the low bidder, and Charles E. Carey, acting Bonneville administrator. The first of the twin circuits, to carry 220,000 volts, will be completed by September 1 and the other by October 1. The Vancouver-Eugene line will be completed about that time.

•

## Cable Contracts Awarded

The Navy has announced award of contracts for electric cable as follows: Anaconda Wire & Cable Co., $66,901; General Electric Co., $65,428; Rockbestos Products Corp., $66,790; Collyer Insulated Wire Co., $68,774; Habirshaw Cable & Wire Division, Phelps Dodge Copper Products Corp., $67,156.


# A VISION OF OPPORTUNITY

**IN NO LARGE INDUSTRY IN THIS COUNTRY is the opportunity for growth comparable with that of the Electric Light and Power business. In the past six years, however, executives and workers have been so much concerned with the immediate problems of business depression and government unfriendliness (as expressed in competition, forced rate reductions, pressure purchases of private properties, etc.,) that their vision has been dimmed. The romance that brought keen minds to the industry is still there, though its edge has been dulled of late.**

**With the court decisions behind us, there is now a new basis for growth, and while it is different in several respects from that existing prior to 1930, it is in many ways less vulnerable. Public opinion has definitely swung to private operation as operating facts and tax losses dispel the mirage of public ownership benefits**

**This is the time, we believe, to bury the past and to look confidently to the future. Growth and opportunity will be measured by the initiative and courage that comes from vision.**

**This "Vision of Opportunity" for men and women of the electric utility industry will be the theme of the June 3rd, 1939 Edison Electric Institute Convention Issue of Electrical World.**

A COMPLETE and completely SAFE LINE OF INSULATED TREE TRIMMING EQUIPMENT!
LEFT—No. 1-B Tree Trimmer easily clips limbs up to 1¼". Patented Compound Lever side cutting head; Bakelite Insulator tested to 105,000 volts; Sitka Spruce, treated handles.
RIGHT—No. 44 Pole Saw for trimming larger limbs. Adjustable 16" peg tooth blade, 7 teeth per inch, light in weight. Also (No. 43) with 12" drag tooth blade.
BELOW—No. 777 Two Hand Pruner of drop forged tool steel with 26" handles. Provides handy rapid cutting. ALSO—Bartlett Tree Paint for preventing growth of wood, destroying fungi, and protecting wounds Applies with ordinary paint brush.
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BARTLETT TREE PAINT
BLACK ANTISEPTIC PRUNING COMPOUND
BARTLETT MFG. CO. DETROIT, MICH.
SEND FOR CATALOG
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All One-Piece
AT NO EXTRA COST
THIS NUT CANNOT DROP
The Blackburn Hinge-type nut retainer is completely concealed within the nut, and has no extending parts to interfere with taping. The nut swings out of the way for installation, and hinges back into place in perfect alignment with the threads.
Specify
BLACKBURN CONNECTORS
You will like them
JASPER BLACKBURN PRODUCTS CORP.
Main and Clinton Sts. St. Louis, Mo.


## Cumberland-Compact, Efficient and Simple

[*Continued from page 39*]

important points are measured at the main control board in front of the boiler by a single instrument with 60 thermocouple switches. This covers the main generator and condenser, feedwater heaters, oil coolers and all the boiler equipment.

Hand control of feedwater supply, supplementing the automatic control, is placed on the main operating floor near the boiler. Boiler blowdown may also be controlled from that point. A number of valves in the feedwater system, for cutting out extraction heaters and other emergency uses, are grouped in an accessible position near the floor of one of the galleries.

### *Electrical Equipment*

A number of interesting features of the electrical equipment resulted from connection of the new station to the old power plant and switching station. All the important control panels for the switching station were moved to the new control room under a program carried out without any interruption of service to customers. Extension of the control circuits therefore was made in an easily accessible outdoor overhead conduit bank, from an existing manhole.

Control panels for numerous 4-kv. feeders leaving the old substation presented a troublesome problem as they supplied important service in Cumberland which should be under the control of the operator in the new plant. Several alternatives were studied. Leaving the panels in their old positions, but equipping the feeders with automatic reclosing relays, would have been expensive and would have involved material reductions of breaker capacities. The usual remote supervisory schemes were also very expensive. A very economical and simple remote control arrangement was therefore devised to enable the operator to identify and reclose immediately from the new control room any 4-kv. breaker which automatically trips open. This was accomplished by the installation of two multi-circuit switches developed for automatic telephone work, one in each plant, with associated relays. Only five wires are required between the new and old control points for control of the fourteen feeders, the existing protective relays of which function just as before.

Considerable saving was effected by dispensing with an oil circuit breaker between the generator and the main transformer bank. Disconnecting devices only are provided at that point, synchronizing being done on the 33-kv. breaker on the high-tension side of the transformers. Short connections to the latter were obtained by placing them immediately outside the turbine room wall. The generator leads are insulated cable run in a ventilated metal inclosure. Buses, circuit breakers and disconnecting devices for both main power and station auxiliary service are housed in modern metal-clad structures. Reliability of supply to the electrical auxiliaries is assured by throw-over equipment which will in case of trouble automatically switch them without interference with operation to a transformer in the old station.

The generator is provided with the usual high sensitivity differential protection, and in addition a second set of differential relays to give over-all protection of the generator and main power connections. These include the 11-kv. connections, bus, main transformers and high-tension oil circuit breaker. An air-break switch is connected in a jumper around the latter. A key interlock connected to the air-break switch is provided to prevent improper relay operation when the regular oil circuit breaker is disconnected for maintenance work.

The electrical control room has very high quality direct lighting, effected by flush units in the ceiling. These are designed and located to give light, without reflections from the instrument cases.

A considerable saving in cost and time was made by designing the 97-ft. high boiler supports to be structurally independent of the building steel. Horizontal stiffness of the building frame was obtained by incorporating rigid vertical frames in the bay containing the equipment galleries. This eliminated much bracing which would have interfered with the placing of equipment and gave a stiff backbone to take all horizontal thrusts, including that of the boiler to which it was tied for the purpose.

W. S. Finlay, Jr., of American Water Works & Electric Company was in general charge of this project, the detail design and construction of which was by Sanderson & Porter.

### Group Analysis Proves That Meter Accuracies Hold Up

[*Continued from page 46*]

1,000 tests. This increase is approximately equal to one-half of the cost of making the test, which test is required regardless of any savings effected therefrom. Further analysis of this increase by age classifications of meters shows that the increase for class C is much greater than that for the two other classes. This would be expected due to the larger percentage of slow meters in class C.

These figures may seem to indicate that it would not be economical to increase the test period, but that, rather, this period should be shortened to take advantage of the increase in revenue obtained by testing. However, revenue increase by more frequent testing is only one factor among many to be considered in setting up test intervals. The amount of revenue recovery is comparatively small as against the increased cost of shorter period testing.

•

## 20-Year Club Numbers 900

When more than 100 new members were inducted into Portland (Ore.) Electric Power Co.'s 20-Year Club at the recent annual meeting that organization boasted of having more than 900 members, or about one-third of all the employees of the company and its subsidiaries. Two men, R. M. Townsend, property agent, and Patrick Hughes, former platform man on the street cars, have been with the company more than 51 years. The average age of service of the entire club membership is 28 years. Franklin T. Griffith, president, was the principal speaker at the banquet.

•

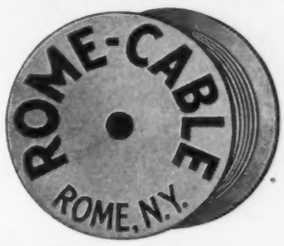
## Rate Rehearing Denied

FPC has denied the petition filed by H. Jerome Jaspan for a rehearing on his complaint against the Philadelphia Electric Co., charging that it is selling electric energy to Delaware Power & Light Co. at a rate below cost of production.

•

## Collects 50-Year Data

Portland General Electric Co. is collecting pictures and data on early electrical equipment as part of its 50-year celebration. O. B. Coldwell, vice-president in charge of the engineering staff, is making a series of slides to illustrate the early growth of the company.


Hot Rolled Copper Rods • Bare and Tinned Strand
Bare and Tinned Copper Wire
(In Rounds, Flats and Squares)
URC Weatherproof Wire
Cotton, Paper and Asbestos Magnet Wire
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A dozen distinctive features give Burndy Bus Connectors the ability to perform under overload, shock, strain and corrosive conditions. On your next job . . . Connect With Burndy!

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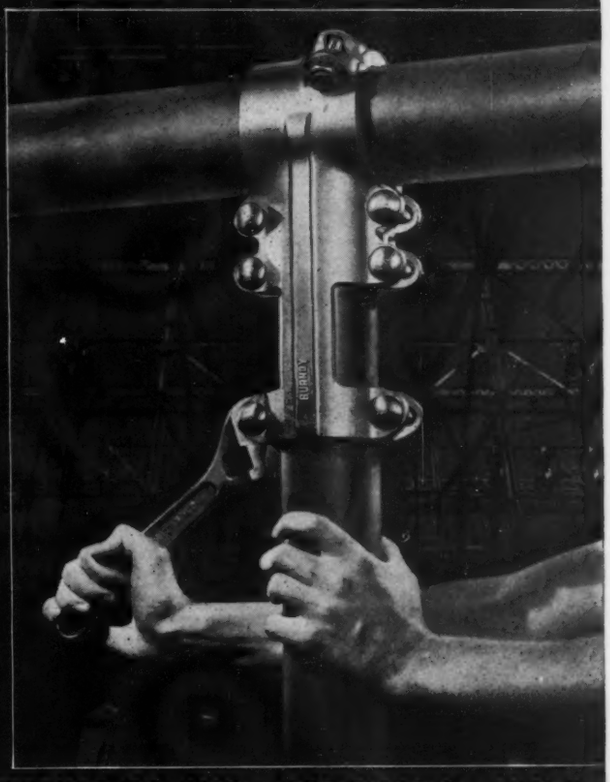

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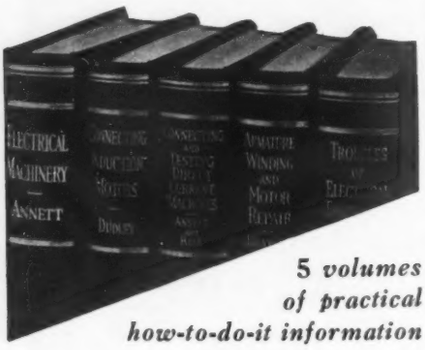
## Every phase of electrical maintenance and repair work covered in this NEW Library




**5 *volumes of practical how-to-do-it information***

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

## Electrical Maintenance and Repair Library

**2042 pages, 1721 illustrations and diagrams**

***These books show you how to***

—install all types of motor and generator units;
—locate breaks in armature windings and do a workmanlike job of rewinding;
—know just what is wrong with an electrical machine and take charge of installation and maintenance work;
—making accurate tests of switchboards and apparatus and correctly balance the power with the load;
—handle every sort of wiring job;
—show competence, whether it be in the use of a Stillson wrench or a Wheatstone bridge.

***New trouble-shooting book***

Now, in addition to four well-known practical books on all details of testing, connecting, rewinding, installing and maintaining electrical machinery, the Library includes Stafford's *Troubles of Electrical Equipment*, a new book full of helpful maintenance information, special trouble-shooting charts, explanation of symptoms and causes of machinery troubles, specific remedies, etc. This revised library gives you the ability to handle bigger jobs with surety of results.

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(Books sent on approval in U. S. and Canada only.)


## Public Service Means Every Aspect of Our Business

[*Continued from page 49*]

and not just from the heads of the company's personnel, goes an immeasurable distance toward improving and maintaining deserved public good will.

***Case No. 4***

Not so long ago a substantial part of our territory was threatened with the loss of a vital transportation system—the Rutland Railroad. When this situation became acute it was quite apparent that the public interest in its continuance transcended all others. Aside from the very important matter of general public good in this situation, the continued welfare of the electric service companies serving the areas involved was also a matter of concern. It was quite natural, therefore, for the officers of our company to take a leading part in organized public efforts put forth in a campaign which came to have almost nation-wide significance as the "Save the Rutland" campaign. For one of the first times in American railroad history public support was organized through an adequately and publicly financed Co-operating Traffic Association, whose job it was, among other things, to get business for an ailing railroad in an endeavor to make it healthy again. While the final results of this unusual campaign cannot yet be tabulated, substantial progress toward its objective has been made. This effort again emphasizes the important responsibilities and opportunities which are the privilege of those who conduct the affairs of "public service" companies.

***Rates Less Important***

It would be idle to say that deserved customer and public good will is not dependent, to some extent, upon the character of the electric service company's rate structure, but I put this down toward the bottom of the list because, no matter how low prices for the service may be, if that service is not good or if it is not rendered in a friendly, understanding and truly serviceable manner, no prices, however low, can make it satisfactory or produce customer and public good will. On the contrary, excessively low prices for service may be in the long run the actual cause for the alienation of customer and public good will. Prices must be such as will make it possible for the company to provide the public with the best possible kind of service and the owners of the capital, which is so essential for the provision of such service, with a fair and reasonable wage for its use.

We must provide, through the manner in which we conduct our business, a wholesome background, popularly understood and popularly accepted, for resistance to unreasoning pressure which, in these days, is too often brought by some not too thoughtful elements of the public for reduction of prices to points where profitable operation is jeopardized. We must keep in mind, as managers of electric service enterprises, that we are in a business that is constantly growing in response to public demand and that such growth necessitates the use of continually increasing amounts of capital which can come only from the savings of willing investors. If, for the public service, we are to get the capital which we need, we must be able to assure Mr. and Mrs. Investor that for that capital a fair wage can be earned and will be paid. All of our business policies must be so established, correlated and administered as to produce this result. The policy with respect to prices is *one* of the important elements of the whole, but it is *by no means the only one* and, perhaps, not the most important.

***Policy Summarized***

Therefore, to do this job of *public service*, which is ours, we must have before us a policy the essential elements of which may, perhaps, be summarized in this manner:

1. Sell a good product.
2. Sell that product through friendly people who understand sympathetically the customers' desires and needs and sincerely try to serve their best interests.
3. Offices and plants should be objects of community pride in appearance, as well as in performance.
4. Officers and employees should be good citizens, willing leaders in good community movements — but never politicians.
5. Management's dealings with the public, its representatives in government, the employees of the company and the security holders, should be

on the basis always of the fullest frankness and friendliness.

6. Prices for service should be fixed on the basis which will truly serve the best interests of the community, the company's employees and the providers of capital.

7. *Public service is our business.*

•

## Co-op Seeks FPC License

Plumas-Sierra Rural Electric Cooperative, Blairsden, Calif., has filed with the FPC application for license for transmission lines with a total length of approximately 250 miles in Lassen, Plumas and Sierra counties, California. The project, which is practically constructed, consists of a network of 12,500-volt and 7,200-volt electric power lines extending from Quincy to a point near Susanville. The energy to be transmitted will be purchased from the Pacific Gas & Electric Co.

•

## Seeks Short-Wave Permit

Louisville Gas & Electric Co. will soon begin to dispatch its trouble-shooters by means of two-way radios controlled from service headquarters. This company is among the first ten in the country to apply for short-wave utility permits operated on ultra-high frequencies authorized in 1937. Construction of the radio communication system, which will control service trucks in all sections of Jefferson County, has been completed and operation will begin as soon as a license is issued by the Federal Radio Commission.

•

## Cost Studies Extension

Finding that the Arkansas Power & Light Co. has "not prosecuted with diligence" the original cost studies required, but by reason of the position in which the company has placed itself an extension of time will be necessary to comply with the commission's accounting regulations and order, the FPC has granted an extension to December 31, 1939.

•

## Wins Tax Cases

The United States Supreme Court has ruled against the Federal Commissioner of Internal Revenue in a tax deficiency controversy with the Metropolitan Edison Co., Pennsylvania Water & Power and the General Gas & Electric Corp. over their right to make income-tax deductions for expenses incurred by Pennsylvania subsidiaries in issuing bonds.


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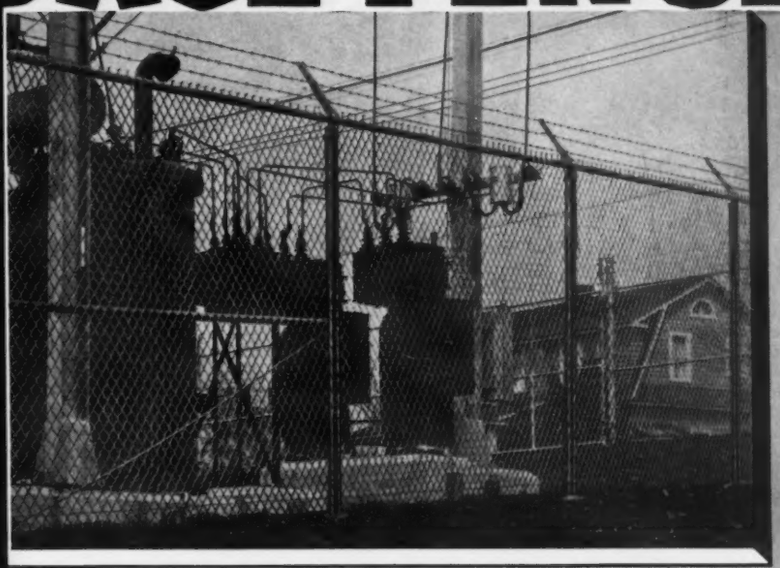

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. . . the actual job of making the splice is quickly and easily done, either on the ground or in the air.

. . . every completed splice has maximum strength equalling or surpassing the rated breaking strength of the wire.

. . . all Nicopress splices are tight as a weld and conductors will not pull out.

. . . neither air nor moisture can seep into a completed splice, so corrosion is minimized and conductivity of wire maintained.

. . . there is no chance of damaging wire when making the splice.

. . . because conductors are butted and not overlapped in this compression method of splicing, no additional wire is needed and much material conserved.

. . . tools are light and convenient to carry, easy to handle and operate.

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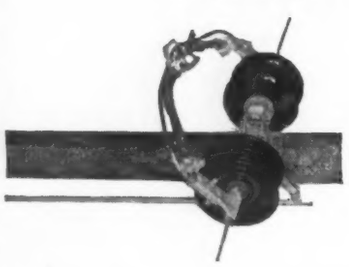
Crapo Galvanized Strand and Telephone Wire can be obtained readily in all standard grades and sizes.

K-P-F

Pole Top High Tension Switches



A K-P-F switch merely consists of two deadends with a rigid jumper containing a contact so arranged that it can be opened and closed. This constitutes the NECESSARY and SUFFICIENT parts of a disconnecting switch.

K-P-F ELECTRIC CO.
855 Howard St. San Francisco

# Letters to the Editor

## Pipe Thawing With House Piping Connected

*To the Editor of* ELECTRICAL WORLD:

It is a little late this season to comment on "Instructions for Thawing Water Pipes," in your issue of November 19, 1938, but I have just happened on it and I believe my comments are of sufficient importance for those interested.

The recommendation that the house piping be disconnected to prevent stray currents is good, but the best point at which to disconnect is not that shown, if the diagram be taken literally. Even if necessary to break more than one joint or temporarily remove a ground clamp, a faucet should be left for the convenient discharge of the water once it starts to run.

There is further method in this madness: the water will usually start to trickle slowly. As soon as it does, the current should be shut off, even if this results in the flow stopping and the necessity of again applying the current (though I cannot remember such an occurrence). The trickle and gradually increasing flow will finish the thawing job. But they will do more. They will clean the pipe and improve the delivery pressure to the house. It is easy to see how this comes about. Most services have more or less mud deposited in them. The heat from the current attacks the ice core from the outside and probably first melts the muddy ice in the bottom of the pipe. But in any event, the ice starts melting from the outside, and if the core can be maintained with a small annular flow of water, the pipe will be very thoroughly scoured and cleaned. In practically every case the water service is greatly improved.

HAROLD GOODWIN, JR.,
Consulting Engineer,
Wyncote, Pa.

•

## Foot-Candles Only 52% After 3 Months Use

*To the Editor of* ELECTRICAL WORLD:

A drop of 45 per cent from design value after three months use may at first glance seem an excessive factor. This value, however, is based on optimum conditions and the loss in illumination is usually greater under conditions met in actual practice. For example:

An office lighting installation is designed for 25 ft.-candles employing a widely used semi-indirect lighting fixture (Type 17 Trans. Illuminating Engineering Society—Vol. XIX, No. 1). The line voltage is 120. The feeders and branch circuits are designed for a 5 per cent voltage drop. A 5 per cent drop in voltage means a 15 per cent drop in lamp output. The 25-ft.-candle design value has already dropped to $(25 \times 0.85) = 21.2$ due to normal voltage drop. The normal lamp depreciation is 17.8 per cent, so that the foot-candles are further reduced to $(21.2 \times 8.22) = 17.4$. The dust and dirt depreciation for the semi-indirect unit is 26 per cent, which reduces the illumination to $(17.4 \times 0.74) = 12.9$. Thus we may expect normal depreciation of at least $\frac{(25 - 12.9)}{25} = 48$ per cent. This simple computation does not take into account the gradual and progressive reduction in reflection factor of the ceiling and walls, excessive voltage drop due to poor wiring, the use of sub-standard lamps, poor maintenance and other factors that usually reduce the efficiency of a lighting system.

Obviously the way to correct this excessive normal drop in illumination is to use lamps having a rated voltage of the actual socket voltage under load and to select a lighting unit of a type having a lower dirt and dust depreciation. For instance, if, in the problem used for an illustration, 115-volt lamps had been used and lighting unit No. 21, the loss would have been only from 25 ft.-candles to $(25 \times 0.975 \times 0.822 \times 0.899) = 18$ or 28 per cent.

DAVIS H. TUCK,
Electrical Engineer
Holophane Co., Inc., New York.

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## E. W. "Quiz" for E.E. Graduates

*To the Editor of* ELECTRICAL WORLD:

Being in charge of placement for our graduates in E.E., one of my problems is to get our students to educate themselves in a broad way as to the scope of the whole electrical engineering field. I prepared a "quiz" for our senior engineers, based entirely on your annual statistical number, and gave it the following announcement:

E. E. Seniors, and others working through the E. E. placement service:

Gentlemen: You are about to become job-candidates, and will soon join some phase of the electrical industry. Irrespective of whether you will go into generation, distribution, or use of energy; research, development, design, sales, application, or operation—in any case, you would do well to have more than just a foggy notion as to the state of the industry.

By way of illustration, you are talking to a manufacturing employer, hoping he will employ you for use on industrial apparatus. He has no opening of that kind, but he asks how you would feel about insulated wire and cable? If your response is a blank stare, he would probably guess that you had never given wire and cable more than a passing thought. Right? Now,

sales of wire and cable amounted to about $70,000,000 in 1938. Isn't that worth more than a blank stare? Furthermore, many engineers are working on wire and cable, and they are doing some fine engineering. Where there are engineers already, openings for young engineers will develop sooner or later.

Nearby, you will find copies of a "quiz" for E. E. seniors on the state of the electrical industry. Every question can be answered by reference to the Annual Statistical Number of the ELECTRICAL WORLD, January 14, 1939.

This is not meant to be a "plug" for the ELECTRICAL WORLD, but we certainly must admit that in this annual number it presents a survey of the state of the industry that is invaluable.

The "quiz" consisted of eleven questions on salient points of information regarding the electrical industry. Total energy output and sales, revenues, steam and hydro production, installed capacities, hours of use of capacity, division of energy sales to, and of revenues from, customer groups, production and sales of electrical goods, expectations of future sales, appliance saturations, energy uses, average rates per kw.-hr. and others were the subjects of the questions.

Here's a suggestion: You folks might, in the statistical number, print such a "quiz" as this. It would be addressed to seniors everywhere. If printed so that the page could be torn out of the placement officer's copy and posted, it would drive a good many seniors to looking at the issue. Or, you might do even better by printing the "quiz" separately and mailing it to all placement officers or to all faculty subscribers. Personally, I like this idea better than the first.

Let me say that the statistical number comes out at a very propitious time of year for placement purposes. It is not too early when some seniors are still apathetic toward their placement problems. If it came out much later it would overlap with the recruiting season and would be too late for educational purposes.

A. D. MOORE,
Professor
Department of Electrical Engineering
University of Michigan, Ann Arbor

•

## Plan New Street Lights

The entire street-lighting system of Denver, Colo., is to be modernized by the installation of mercury and sodium vapor lamps during the next few years, according to city officials. Mayor Stapleton declared that the modernization will be a gradual process to take advantage of recent advances in the lighting of public thoroughfares. Conferences are being held with the Public Service Co. of Colorado.

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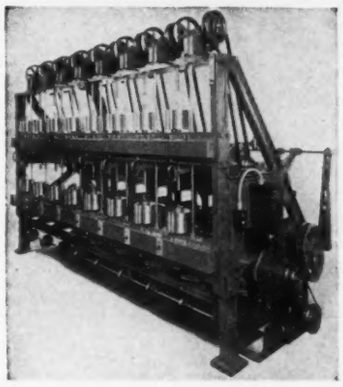

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GETTING ALONG WITH PEOPLE
by MILTON WRIGHT

## REA Lets Contracts; Recent Allotments

Announcement has been made by REA that the following construction contracts have recently been let:

Sumter County Electric Membership Corp., Americus, Ga., D. L. Thomas, supt., and J. B. McCrary Engineering Corp., Atlanta, engineer, contract to W. L. Florence Construction Co., Powder Springs, Ga., another section of project, consisting of 344 miles of line, 703 members; bid $160,340.

Central Georgia Electric Membership Corp., Jackson, Ga., M. O. McCord, supt., and J. B. McCrary Engineering Corp., contract to Edward S. Moore and Son, St. Petersburg, Fla., another section of project, 351 miles of line, 875 members; bid $163,407.

Coles-Moultrie Electric Co-op., Mattoon, Ill., John G. Waggoner, supt., and Caldwell Engineering Co., Jacksonville, engineer, contract to Cater Construction Co., Kansas City, Mo., entire project, 340 miles of line, 955 members; bid $258,685.

Monroe County Electric Co-op., Inc., Waterloo, Ill., C. M. Douglas, supt., and J. G. Cooney, Belleville, engineer, contract to Monroe Electric Co., Chicago, entire project, 177 miles of line, 400 members; bid $142,290.

Corn Belt Electric Co-op., Inc., Bloomington, Ill., T. H. Hafer, supt., and Michael Drazen, engineer, contract to Cater Construction Co., Kansas City, Mo., and I. and E. Construction Co., Minneapolis, Minn., second and fourth sections of project, 504 miles of line, 1,260 members; bid $254,106 and $106,782.

Jackson County Rural Elec. Co-op. Corp., McKee, Ky., Ralph Skiff, supt., and Ray W. Chanaberry, Louisville, and H. R. Kertenstein, engineers, contract to J. M. Perkins, Frankfort, Ky., entire project, 130 miles of line, 544 members; bid $105,731.

Yazoo Valley Electric Power Assn., Yazoo City, Miss., C. N. Blakemore, supt., and E. A. Bowman, Greenwood, Miss., engineer, contract to Sullivan, Long and Haggerty, Bessemer, Ala., another section of project, consisting of 180 miles of line, 520 members; bid $105,156.

Inter-County Electric Co-op., Assn., Licking, Mo., William R. Fisher, supt., and Midwestern Engineering & Construction Co., Tulsa, Okla., engineer, contract to Midland Constructors, Inc., Chicago, Ill., for building another section of project, consisting of 235 miles of line, 535 members; bid $202,040.

Ozark Border Elec. Co-op., Ellsinore, Mo., A. I. Moore, supt., and E. T. Archer, Kansas City, Mo., engineer, contract to R. B. Potashnick, Cape Girardeau, Mo., entire project, 253 miles of line, 723 members; bid $182,797.

Loup River Public Power District, Columbus, Neb., Victor Young, supt., and R. H. Reed, Abilene, Kan., engineer, contract to Dwight Chapin, Jr., Hastings, Neb., for building another section of project, 176 miles of line, 305 members; bid $107,436.

Cherokee County Electric Co-op. Assn., Rusk, Tex., J. H. Leverman, supt., and William G. Morrison, Waco, Tex., engineer, contracts to Summers and Thomas, Nachodochos, Tex., and Reynolds and Sutton, Tyler, Tex., two sections of project, 361 miles of line, 730 members; bids $92,769 and $131,197.

The Comanche County Electric Co-op. Assn., Comanche, Tex., Arthur C. Thomas, supt., and William G. Morrison, Waco, Tex., engineer, contract to O. O. Fuller Construction Co., Nevada, Mo., building the project, 200 miles of line, 550 members; bid $137,218.

Among the recent allotments made by the REA are the following:

ALABAMA—Black Warrior Electric Membership Corp., C. N. Allen, president, Greensboro, $446,000 to build 494 miles of line, 1,760 members in Greene, Marango, Hale, Tuscaloosa, Pickens, Sumter, Dallas and Perry counties. Central Alabama Electric Membership Corp., Maury A. McWilliams, president, Prattville, $384,000 to build 459 miles of line, 1,701 members in Autauga, Elmore, Coosa, Chilton and Bibb counties.

ARKANSAS—Craighead Electric Co-op. Corp., Robert Cherry, supt., Jonesboro, $365,000 to build 405 miles of line, 1,296 members in Craighead, Poinsette, Greene, Lawrence and Independence counties. Woodruff Electric Co-op. Corp., Fay E. Elzey, supt., Augusta, $316,000 to build 355 miles of line, 1,300 members in Woodruff, Prairie, Cross, St. Francis, Monroe, Lee and Philips counties.

INDIANA—Sullivan County REMC., C. O. Drake, president, Sullivan, $200,000 to build 181 miles of line, 784 members in Sullivan County. Jackson County REMC, Willard S. Boyle, supt., Brownstown, $170,000 to build 193 miles of line, 500 members in Washington County.

KENTUCKY—Fleming-Mason Rural Electric Co-op. Corp., Inc., James K. Smith supt., Flemingsburg, $227,000 to build 201 miles of line, 862 members in Mason, Bracken, Robertson, Bath, Carter and Lewis counties.

LOUISIANA—Northeast Louisiana Power Co-op., Inc., H. B. Landis, president, Winnsboro, $116,000 to build 136 miles of line, 393 members in Franklin and Richland counties.

MICHIGAN—Tri-County Electric Co-op., Inc., Dolph Wolf, supt., Portland, $100,000 to build 95 miles of line, 324 members in Isabella, Gratiot, Clare and Montcalm counties.

PENNSYLVANIA—New Enterprise Rural Electric Co-op., Inc., E. W. Van Horn, president, New Enterprise, $250,000 to build 210 miles of line, 862 members in Bedford and Somerset counties. Valley Rural Electric Co-op., Inc., John H. Gahagan, president, $250,000 to build 205 miles of line, 946 members in Blair and Huntingdon counties.

WISCONSIN—Jackson Electric Co-op., Black River Falls, Marcellus J. Smith, supt., $184,000 to build 164 miles of line, 489 members in Jackson, Monroe, and La Crosse counties. Jump River Electric Co-op., Inc., Jump River, Ward Herrick, president, $150,000 to build 146 miles of line, 500 members in Rusk, Taylor and Chippewa counties.

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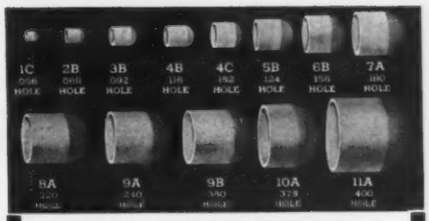
## Instructions for Blind

Edison General Electric Appliance Co., Inc., will issue, free of charge, a set of individual electric range instructions, in Braille, to every sightless person for whom a Hotpoint range is purchased. The instructions will be prepared by Miss Gretta Griffs, blind home economist, who has demonstrated the range at cooking schools, home service conferences and sales training classes.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The Information for Bidders, Form of Bid, Form of Contract, Specifications, and Forms of Bonds may be examined at said office and copies thereof obtained upon payment of $5.00 for each set. Any Bidder, upon returning such set promptly and in good condition, will be refunded his payment. Non-bidders will be refunded $2.00 upon return of said documents within 10 days of opening of bids.

The Mayor and Council of Easton reserve the right to waive any informalities in or to reject any or all bids.

Each bidder must deposit with his bid security in an amount of not less than five percentum (5%) of the base bid in the form and subject to the conditions provided in the Information for Bidders.

No bidder may withdraw his bid within thirty (30) days after the actual date of the opening thereof.

E. G. Kastenhuber, Jr.
Town Engineer.

Easton, Maryland.
April 17, 1939.

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